SOIL SURVEY OF

Harrison County, Indiana

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Purdue University Agricultural Experiment Station

Issued February 1975

Major fieldwork for this soil survey was done in the period 1964–68. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1969. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Harrison County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Harrison County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside, and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the woodland group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and the woodland groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Engineers, builders, community planners, and others can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Harrison County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

Cover: **The result of good use of land and good management practices is shown in this typical area of gently sloping and moderately sloping Crider soils (center) and strongly sloping Hagerstown soils (foreground).**

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SOIL SURVEY OF HARRISON COUNTY, INDIANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

HARRISON COUNTY is in the extreme south-central part of Indiana (fig. 1). It has an area of 479 square miles, or 306,560 acres. Corydon, in the central part of the county, is the county seat.

Much of the county is on uplands and is strongly sloping to very steep. Many of the bottom lands, including those along the Ohio River, are subject to flooding. Terraces along the Ohio River and its major tributaries are nearly level and gently sloping. In many places steep escarpments separate the terraces from the bottom lands.

Most of the acreage is wooded or is used for permanent pasture. A small percentage, mostly on bottom lands, terraces, and broad ridgetops, is used for cultivated crops. The farms are used mostly for general crops rather than special ones. Livestock and livestock products, however, are the major sources of farm income.

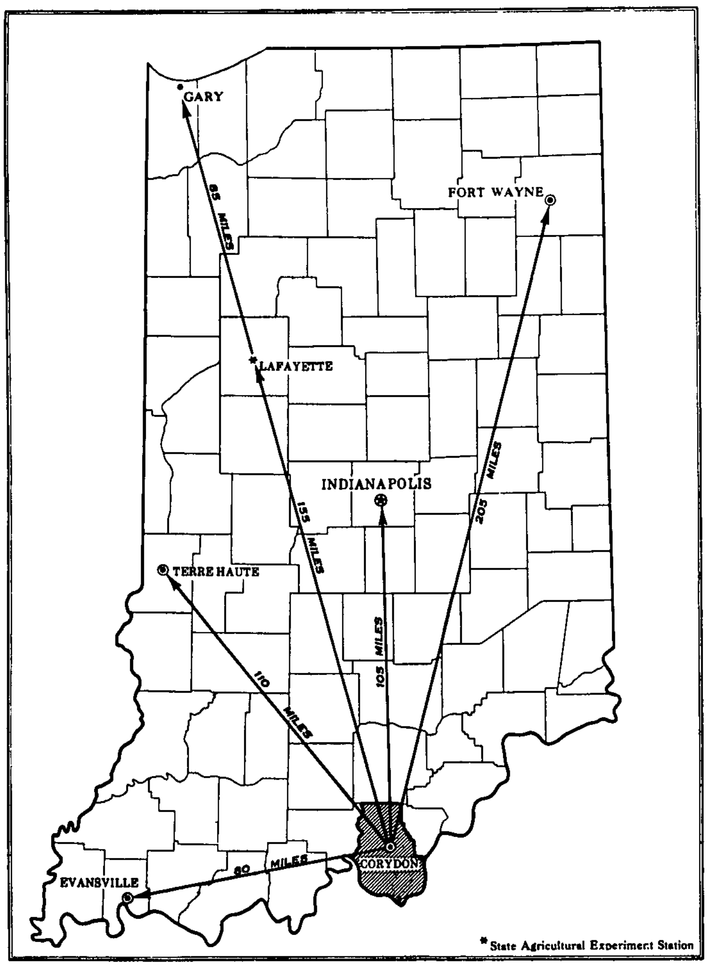

Figure 1.—Location of Harrison County in Indiana.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Harrison County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Alford and Bartle, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of

such differences, a soil series is divided into phases. The name of a soil indicates a feature that affects management. For example, Alford silt loam, 2 to 6 percent slopes, is one of several phases within the Alford series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. One such kind of mapping unit is shown on the soil map of Harrison County—the soil complex.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Weikert-Berks channery silt loams, 35 to 60 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gullied land is a land type in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as materials for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or to a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Harrison County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The five soil associations in Harrison County are discussed in the following pages. The terms for texture used in the title apply to the texture of the surface layer. For example, in the title of association 1, the words "medium textured" refer to the surface layer.

The general soil map of Harrison County does not join precisely with that of Crawford County to the west. The Blue River, a major tributary of the Ohio River, forms a common boundary for the two counties. Soil patterns on opposite sides of the Blue River are slightly different.

1. Crider-Baxter Association

Rolling, deep, well-drained, medium-textured, cherty soils on uplands

This association (fig. 2) is on uplands. The soils, which are mostly rolling (fig. 3), formed in windblown silt over material weathered from cherty limestone. They characteristically have many sinkholes, and in places as many as 100 of these are in an area of 1 square mile. The sinkholes range from 15 feet to ½ mile in width and from 3 to 90 feet in depth. Sinkholes are commonly funnel shaped.

The association occupies about 108,000 acres, or about 35 percent of the county. Crider soils make up about 41 percent of the association and Baxter soils about 36 percent. The remaining 23 percent is minor soils.

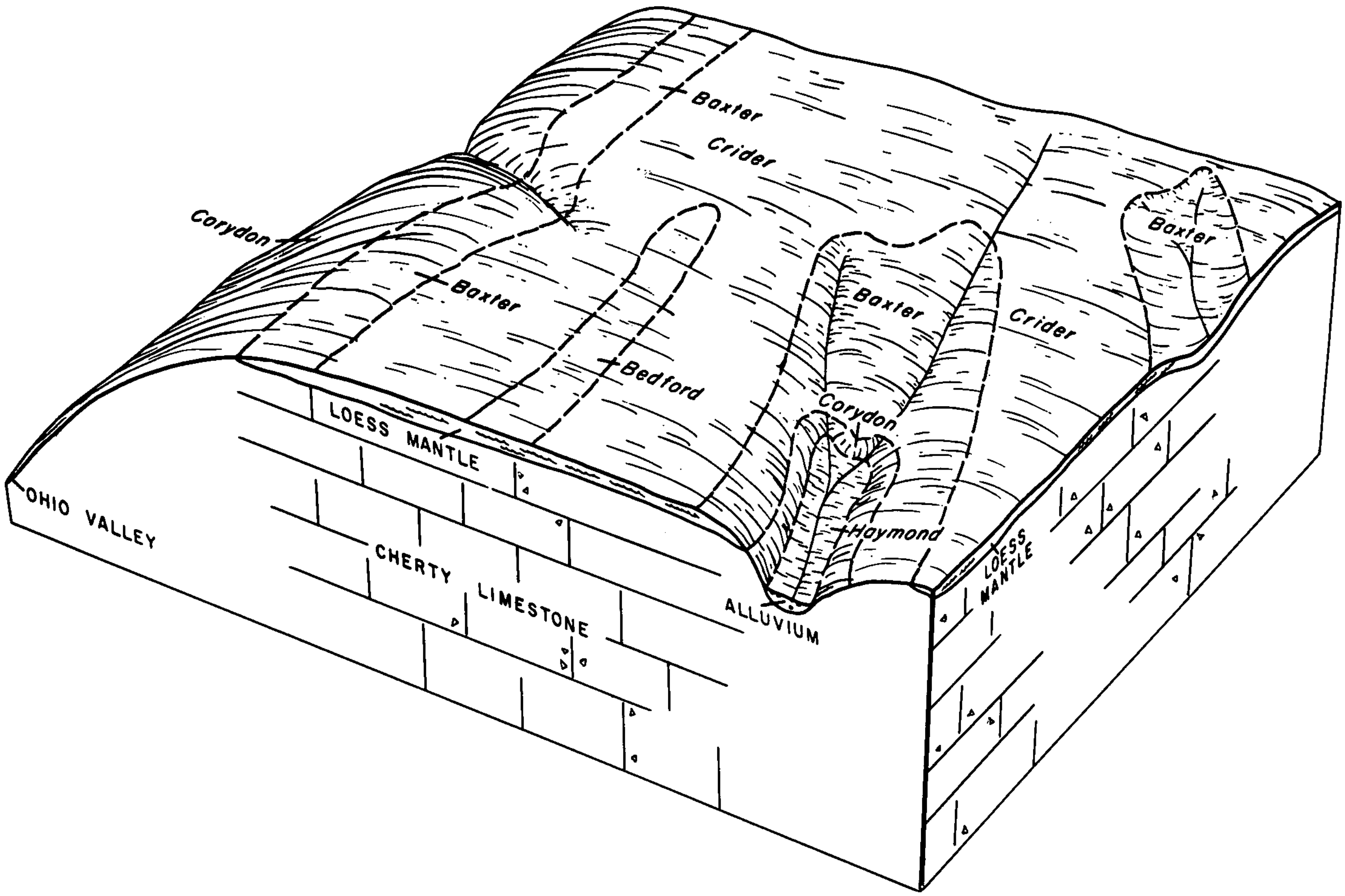

Figure 2.—**General parent material, position, and pattern of soils in Crider-Baxter association.**

Figure 3.—**Limestone valley near Valley City in the Crider-Baxter soil association.**

Crider soils are on tops and sides of ridges. They have a dark-brown surface layer about 8 inches thick. The subsoil is strong-brown silty clay loam in the upper part and variegated red, yellow, and brown cherty silty clay in the lower part. It is strongly acid to very strongly acid.

Baxter soils are also on tops and sides of ridges. They have a dark-brown and yellowish-brown surface layer about 8 inches thick. The subsoil is red cherty silty clay loam and in places has yellowish-brown mottles. It is strongly acid.

Bedford, Haymond, and Corydon soils are among the minor soils of this association. Bedford soils are gently sloping and are on ridges around sinkholes. Haymond soils are nearly level and are on bottoms in sinkholes. Corydon soils are very steep and are on bluffs along creeks.

Most areas of soils in this association are used for crops. Corn, soybeans, small grain, and tobacco are the main crops. Meadows are prevalent. General livestock farming is the main enterprise in this area. Timber is an important source of income. The hazards of erosion and runoff are the main concerns of management.

2. Baxter-Crider Association

Mainly rolling and hilly, deep, well-drained, medium-textured, cherty soils on uplands

This association (fig. 4) is on uplands on the sinkhole plain. The soils characteristically have many sinkholes and depressions, and in places as many as 100 of these are in an area of 1 square mile. The sinkholes and depressions range from 15 feet to ½ mile in width and from 3 to 90 feet in depth. Sinkholes are commonly funnel shaped.

The association occupies about 93,700 acres, or 31 percent of the county. Baxter soils make up about 70 percent of the association and Crider soils about 20 percent. The remaining 10 percent is minor soils.

Baxter soils are on tops and sides of ridges. These soils formed in 0 to 20 inches of windblown silt over material weathered from cherty limestone. They have a dark-brown and yellowish-brown surface layer about 8 inches thick. The subsoil is red cherty silty clay loam and in places has yellowish-brown mottles. It is strongly acid.

Crider soils are also on tops and sides of ridges. They formed in 20 to 40 inches of windblown silt over material weathered from cherty limestone. These soils are rolling and hilly. They have a dark-brown surface layer about 8 inches thick. The subsoil is strong-brown silty clay loam in the upper part and variegated red, yellow, and brown cherty silty clay in the lower part. It is strongly acid to very strongly acid.

Corydon and Haymond soils are among the minor soils of this association. Corydon soils are very steep. They are in bluffs along Indian and Buck Creeks. Haymond soils are on bottoms in sinkholes.

Most areas of soils in this association are used for crops. Small grain is one of the main crops, but corn and soybeans are also grown. Meadows are prevalent. About a third of the areas are wooded, and timber is an important source of income. The hazards of runoff and erosion are the chief management concerns.

3. Corydon-Gilpin-Berks Association

Steep and very steep, shallow and moderately deep, well-drained, medium-textured soils on uplands

This association is on uplands (fig. 5). The soils formed in residuum from limestone or sandstone and shale, and some have a thin mantle of loess (windblown silt). They are mostly steep and very steep and are on uplands and in areas between floors of valleys and ridgetops (fig. 6).

The association occupies about 63,800 acres, or about 21 percent of the county. Corydon soils make up about 50 percent of the association, Gilpin soils about 13 per-

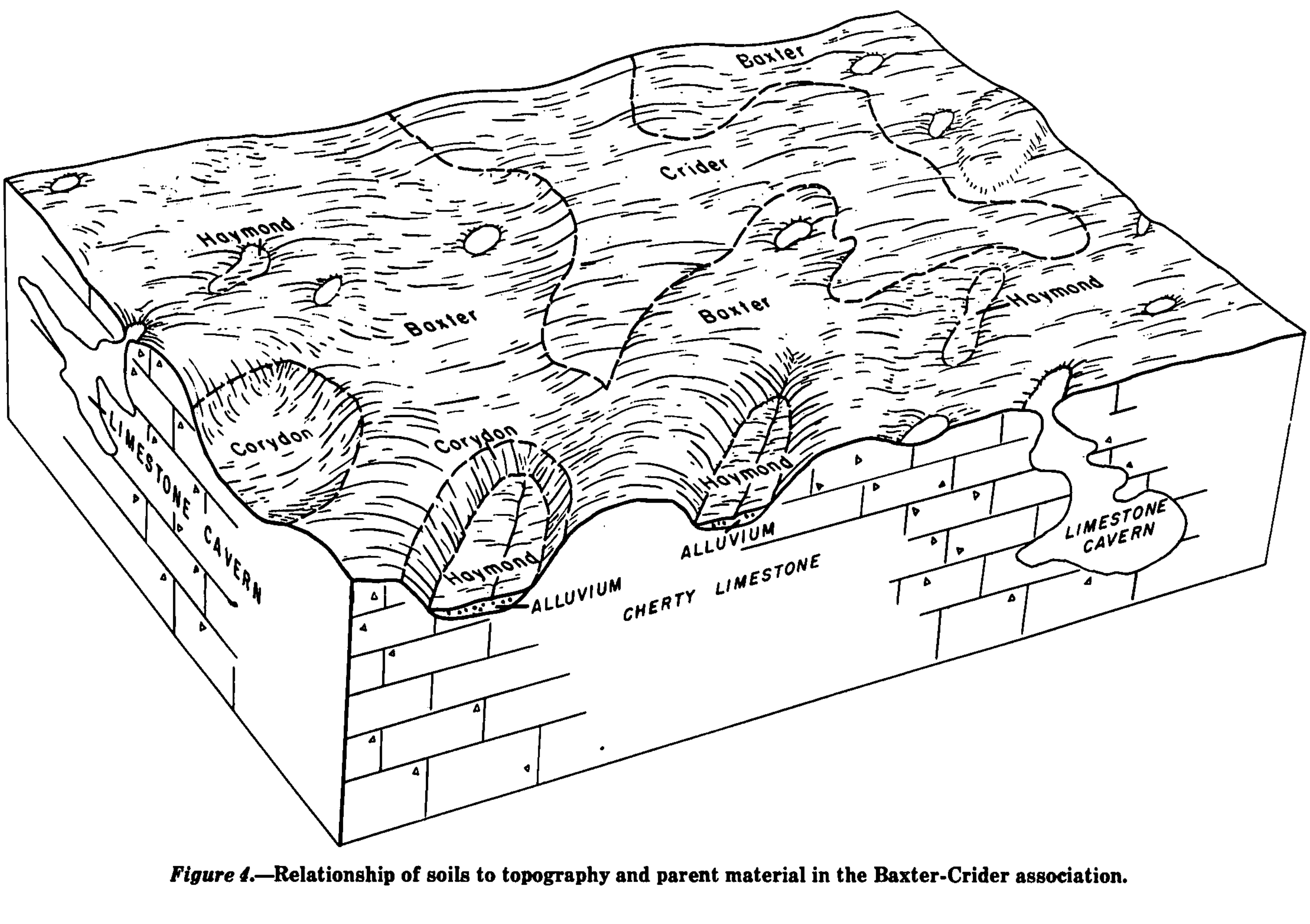

Figure 4.—**Relationship of soils to topography and parent material in the Baxter-Crider association.**

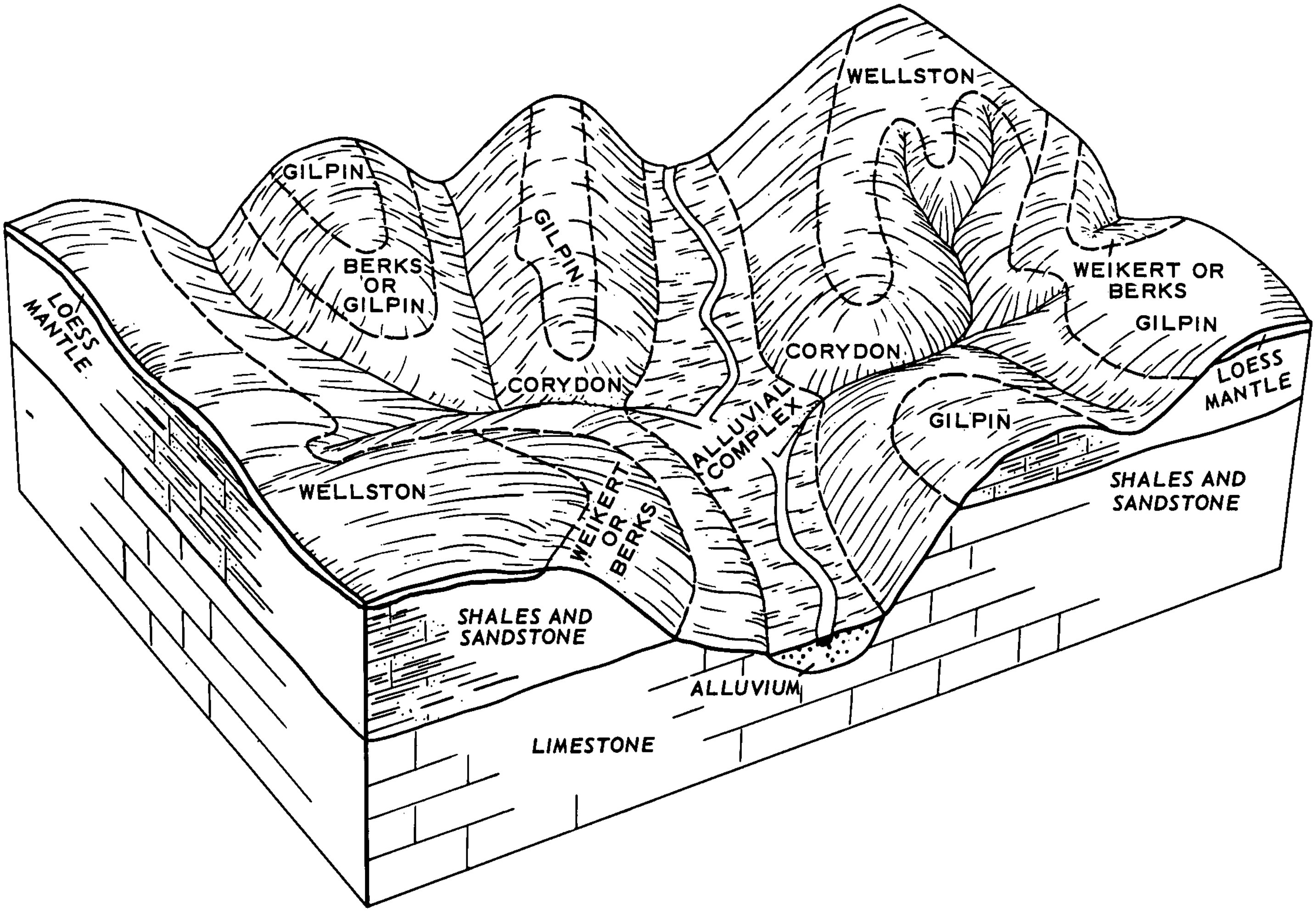

Figure 5.—Relationship of soils to topography and parent material in the Corydon-Gilpin-Berks association.

Figure 6.—View of the Harrison-Crawford State Forest, showing dominantly Corydon, Berks, Gilpin, and Weikert soils.

cent, and Berks soils about 10 percent. The remaining 27 percent is minor soils.

Corydon soils formed in residuum from limestone. They have a dark-brown stony surface layer about 9 inches thick. The subsoil is dark-brown stony silty clay. These soils are underlain by limestone bedrock at a depth of 10 to 20 inches. They are steep and very steep.

Gilpin soils are below ridgetops in the uplands. Slopes are long and steep in some areas and very steep where soils occupy breaks. The soils formed in residuum from sandstone and shale and have a thin mantle of loess (windblown silt). They have a dark grayish-brown and pale-brown silt loam surface layer about 12 inches thick. The subsoil is strong-brown silty clay loam. These soils are underlain by sandstone and shale bedrock at a depth of 20 to 40 inches.

Berks soils are on long sides of ridges in the uplands. Slopes are long and steep. These soils formed in residuum from sandstone and shale. They have a very dark grayish-brown and dark yellowish-brown channery silt loam surface layer about 11 inches thick. The subsoil is yellowish-brown channery silt loam and is 35 to 50 percent

coarse fragments. These soils are underlain by sandstone and shale bedrock at a depth of 20 to 36 inches.

Johnsburg, Weikert, Wellston, and Zanesville soils are among the minor soils of this association. Zanesville and Johnsburg soils are nearly level to moderately sloping and are on ridgetops. Weikert soils are very steep and are on the tops and sides of ridges.

Most areas of this association are wooded and are suited to this use. Steepness and shallowness to bedrock restrict general usage of these soils for cropland, but a few small areas of minor soils that are gently sloping and moderately sloping are used for cultivated crops and meadow. The harvesting of trees for various wood products is the main income-producing enterprise.

4. Haymond-Huntington Association

Nearly level, deep, well-drained, medium-textured soils formed in alluvium on bottom lands

This association is on first bottoms along rivers and major streams and their tributaries (fig. 7). The soils formed in silty and sandy alluvium. Cropping is generally intense, especially on the well-drained major soils of the Huntington series and the well-drained minor soils of the Wheeling series.

The association occupies about 31,860 acres, or about 10 percent of the county. Haymond soils make up about 52 percent of the association and Huntington soils about 10 percent. The remaining 38 percent is minor soils.

Haymond soils have a dark-brown surface layer about 9 inches thick. The subsoil is dark yellowish-brown silt loam. It is neutral and slightly acid.

Huntington soils have a very dark grayish-brown surface layer about 12 inches thick. The subsoil is dark-brown silt loam and silty clay loam. It is neutral.

Elkinsville, Markland, McGary, Newark, Pekin, Sciotoville, Weinbach, and Wheeling are among the minor soils of this association. Elkinsville, Markland, McGary, Pekin, Sciotoville, Weinbach, and Wheeling soils are on terraces. Slopes range from nearly level to moderately sloping. Newark soils are on bottom lands and are subject to flooding.

The soils in this association are suited to corn, soybeans, and other row crops commonly grown in the county. They are also used for pasture and trees. Except for the hazard of flooding, these soils have few or no limitations for use as cropland.

***Figure 7.*—View of the Ohio Valley east of Mauckport, Haymond-Huntington association.**

5. Bedford-Bartle Association

Nearly level and gently sloping, deep, moderately well drained and somewhat poorly drained, medium-textured soils with a brittle, very slowly permeable subsoil (fragipan); on uplands

This association is in two small areas on uplands (fig. 8). One area is southeast of Palmyra and the other is northeast of New Middletown. The soils formed partly in loess and partly in the underlying material weathered from cherty limestone. They have a firm, brittle, and very slowly permeable fragipan at a depth of about 24 inches.

The association occupies about 9,200 acres, or about 3 percent of the county. Bedford soils make up about 40 percent of the association and Bartle soils about 30 percent. The remaining 30 percent is minor soils.

Bedford soils are moderately well drained. They have a brown surface layer about 9 inches thick. The subsoil is dark-brown silty clay loam that has a few gray mottles.

Bartle soils are somewhat poorly drained. They have a dark-brown and gray surface layer about 12 inches thick. The subsoil is brownish-gray silty clay loam that has many gray mottles.

Baxter, Crider, and Haymond soils are among the minor soils of this association. Crider soils are gently sloping and moderately sloping and are on the tops and sides of ridges. Baxter soils are strongly sloping and are on side slopes. Haymond soils are nearly level and are on bottoms in sinkholes.

The soils of this association are suited to all cultivated crops commonly grown in the county. They are also used for permanent pasture and trees. General livestock farming is the main enterprise. The shallow root zone in these soils and wetness of the Bartle soils are limitations to use and management.

Descriptions of the Soils

This section describes the soil series and mapping units in Harrison County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds

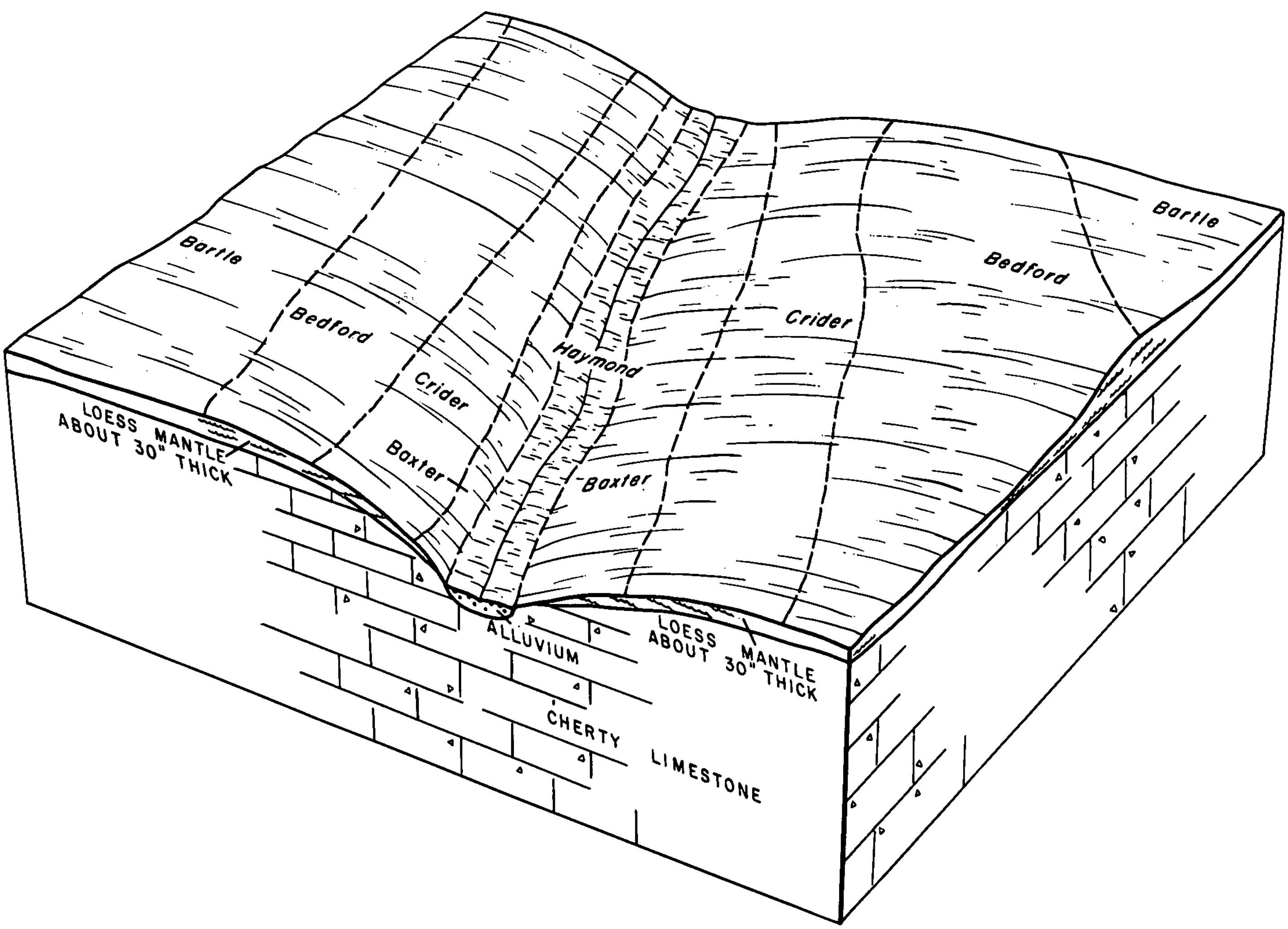

Figure 8.—**General parent material, position, and pattern of soils in Bedford-Bartle association.**

true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Unless otherwise stated, color terms are for moist soil, and percentage of coarse fragments in soil mass refers to percentage by volume.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Quarries, for example, do not belong to a soil series, but nevertheless, are listed in alphabetic order along with the soil series.

Following the name in each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each capability unit or woodland group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*12*).[1]

Alford Series

The Alford series consists of deep, gently sloping to steep, well-drained soils that formed in silty material on uplands near the Ohio River. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 8 inches thick. The subsoil, about 42 inches thick, is dark yellowish-brown friable silt loam in the upper 9 inches, dark-brown friable light silty clay loam in the middle 18 inches, and strong-brown friable silt loam in the lower 15 inches. The underlying material is yellowish-brown silt loam.

Alford soils are moderate in content of organic matter. They are low in available phosphorous and medium or high in potassium. Available water capacity is high, and permeability is moderate.

Representative profile of Alford silt loam, 6 to 12 percent slopes, eroded, in a cultivated field, 200 feet east and 1,500 feet south of the northwest corner of sec. 3, T. 6 S., R. 3 E.:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1t—8 to 17 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; thin dark-brown (7.5YR 4/4) clay films on faces of most peds; slightly acid; clear, smooth boundary.

B2t—17 to 35 inches, dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; friable; thin reddish-brown (5YR 4/4) clay films on faces of most peds; strongly acid; clear, smooth boundary.

B3t—35 to 50 inches, strong-brown (7.5YR 5/6) silt loam; weak, coarse, subangular blocky structure; friable; thin reddish-brown (5YR 4/4) clay films on faces of most peds; strongly acid; gradual, wavy boundary.

C—50 to 108 inches, yellowish-brown (10YR 5/6) silt loam; massive; friable; neutral.

The solum ranges from 40 to 60 inches in thickness. Depth of the loess ranges from 72 to 120 inches. Below the loess the material ranges from that weathered from interbedded sandstone, siltstone, shale, and limestone to sand and gravel.

The A1 horizon in wooded areas ranges from 2 to 4 inches in thickness. It ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The A2 horizon is 3 to 8 inches thick, and it ranges from dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4). In the dominant colors of the B horizon hue is 7.5YR or 10YR, value is 4 or 5, and chroma is 3 to 6. The B2 horizon is silt loam or silty clay loam.

Alford soils are similar to Wellston and Princeton soils. They are deeper to bedrock than Wellston soils and siltier than Princeton soils.

Alford silt loam, 2 to 6 percent slopes (AfB).—This soil is on narrow ridgetops and in areas along shallow drainageways. It has a profile similar to that of the soil described as representative for the series, but the surface layer is about 2 inches thicker.

Included with this soil in mapping werė small areas of slightly eroded Alford soils that have slopes of less than 2 percent. Also included were a few small areas of moderately well drained soils that in places have red and gray mottles in the subsoil.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. The soil is suited to all crops commonly grown in the county. It is also suited to orchards. Capability unit IIe-3; woodland group 1o1.

Alford silt loam, 6 to 12 percent slopes, eroded (AfC2).—This soil is on long narrow ridges and short breaks adjacent to ridgetops. It has the profile described as representative for the series.

Included with this soil in mapping were small areas of slightly eroded and severely eroded Alford soils and a few areas where slope is more than 12 percent.

Runoff is medium on this soil, and erosion and runoff are the major concerns of management. This soil is suited to all crops commonly grown in the county. It is also suited to orchards. Capability unit IIIe-3; woodland group 1o1.

Alford silt loam, 18 to 35 percent slopes, eroded (AfF2).—This soil is on sides of ridges, along drainageways, and on short breaks along major streams near the Ohio River. It has a profile similar to that described as representative for the series, but the surface layer is about 2 inches thinner.

Included with this soil in mapping were small areas of severely eroded Alford soils and a few areas where slope is less than 18 percent.

[1] Italic numbers in parenthesis refer to Literature Cited, p. 76.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Alford silt loam, 2 to 6 percent slopes	203	0.1
Alford silt loam, 6 to 12 percent slopes, eroded	282	.1
Alford silt loam, 18 to 35 percent slopes, eroded	544	.2
Bartle silt loam	5,082	1.7
Baxter silt loam, 2 to 6 percent slopes, eroded	356	.1
Baxter silt loam, 6 to 12 percent slopes, eroded	5,027	1.6
Baxter silt loam, 12 to 18 percent slopes, eroded	7,620	2.5
Baxter cherty silt loam, 6 to 12 percent slopes, eroded	550	.2
Baxter cherty silt loam, 12 to 18 percent slopes, eroded	11,181	3.7
Baxter cherty silt loam, 18 to 25 percent slopes, eroded	9,711	3.1
Baxter cherty silt loam, 25 to 35 percent slopes, eroded	1,101	.3
Baxter silty clay loam, 2 to 6 percent slopes, severely eroded	874	.2
Baxter silty clay loam, 6 to 12 percent slopes, severely eroded	15,173	5.0
Baxter cherty silty clay loam, 6 to 12 percent slopes, severely eroded	12,010	4.0
Baxter cherty silty clay loam, 12 to 18 percent slopes, severely eroded	36,873	12.1
Baxter cherty silty clay loam, 18 to 25 percent slopes, severely eroded	4,207	1.3
Bedford silt loam, 0 to 2 percent slopes	1,142	.3
Bedford silt loam, 2 to 6 percent slopes, eroded	9,623	3.2
Bedford silt loam, 2 to 6 percent slopes, severely eroded	291	.1
Corydon stony silt loam, 20 to 60 percent slopes	35,293	11.5
Crider silt loam, 2 to 6 percent slopes, eroded	22,872	7.4
Crider silt loam, 6 to 12 percent slopes, eroded	12,028	3.9
Crider soils, 2 to 6 percent slopes, severely eroded	4,407	1.4
Crider soils, 6 to 12 percent slopes, severely eroded	23,679	7.7
Elkinsville silt loam, 0 to 2 percent slopes	569	.2
Elkinsville silt loam, 2 to 6 percent slopes, eroded	1,221	.4
Elkinsville silt loam, 6 to 12 percent slopes, eroded	247	.1
Elkinsville silt loam, 6 to 12 percent slopes, severely eroded	309	.1
Gilpin silt loam, 12 to 18 percent slopes, eroded	655	.2
Gilpin silt loam, 12 to 20 percent slopes, severely eroded	826	.2
Gilpin silt loam, 18 to 25 percent slopes, eroded	2,568	.8
Gilpin-Berks complex, 18 to 30 percent slopes	9,940	3.2
Gullied land	13,771	4.5
Hagerstown silt loam, 6 to 12 percent slopes, eroded	286	.1
Hagerstown silt loam, 12 to 18 percent slopes, eroded	1,962	.6
Hagerstown silt loam, 18 to 25 percent slopes, eroded	1,817	.6
Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	1,359	.4
Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded	5,583	1.8
Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded	1,306	.4
Haymond silt loam	16,791	5.4
Huntington silt loam	2,916	.9
Johnsburg silt loam	274	.1
Markland silt loam, 2 to 6 percent slopes, eroded	216	.1
Markland silt loam, 8 to 18 percent slopes, eroded	213	.1
Markland silt loam, 25 to 70 percent slopes	213	.1
Markland silty clay loam, 8 to 18 percent slopes, severely eroded	273	.1
McGary silt loam	156	.1
Montgomery silty clay loam	133	.1
Newark silt loam	1,013	.4
Pekin silt loam, 0 to 2 percent slopes	510	.2
Pekin silt loam, 2 to 6 percent slopes, eroded	520	.2
Princeton fine sandy loam, 6 to 12 percent slopes, eroded	163	.1
Princeton fine sandy loam, 12 to 18 percent slopes, eroded	118	.1
Quarries	156	.1
Sciotoville silt loam, 0 to 2 percent slopes	420	.2
Sciotoville silt loam, 2 to 6 percent slopes, eroded	647	.2
Tilsit silt loam, 2 to 6 percent slopes, eroded	3,862	1.2
Weikert-Berks channery silt loams, 35 to 60 percent slopes	5,271	1.7
Weinbach silt loam	1,365	.4
Wellston silt loam, 6 to 12 percent slopes, eroded	402	.2
Wellston silt loam, 6 to 12 percent slopes, severely eroded	306	.1
Wellston silt loam, 12 to 18 percent slopes, eroded	1,568	.5
Wellston silt loam, 12 to 18 percent slopes, severely eroded	1,432	.5
Wheeling silt loam, 0 to 2 percent slopes	383	.1
Wheeling silt loam, 2 to 6 percent slopes, eroded	934	.3
Wheeling loam, 6 to 12 percent slopes, eroded	254	.1
Wheeling loam, 6 to 12 percent slopes, severely eroded	217	.1
Wheeling loam, 12 to 25 percent slopes, eroded	637	.2
Zanesville silt loam, 6 to 12 percent slopes, eroded	603	.2
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	1,054	.3
Zanesville silt loam, 12 to 18 percent slopes, eroded	322	.1
Water	670	.2
Total	306,560	100.0

Runoff is rapid or very rapid on this soil, and erosion and runoff are the major concerns in use and management. The soil is suited to permanent pasture. Capability unit VIe–1; woodland group 1r2.

Bartle Series

The Bartle series consists of deep, nearly level, somewhat poorly drained soils that formed in old alluvium in large basins in uplands. These basins are drained by sinkholes within the basin or internally by way of underlying limestone. Minor areas of these soils are on terraces. These soils have a fragipan in the lower part of the subsoil. The native vegetation was hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 9 inches thick. The subsurface layer, about 3 inches thick, is gray silt loam that has yellowish-brown mottles. The subsoil is about 48 inches thick. The upper 16 inches is pale-brown and light-gray friable silt loam. Mottles are yellowish brown and light brownish gray. The lower 32 inches is a fragipan of light brownish-gray and gray very firm heavy silt loam and

silty clay loam. Mottles in this part of the subsoil are brownish yellow and strong brown. The underlying material is gray silty clay loam that has strong-brown mottles.

Bartle soils are moderate in content of organic matter and low in available phosphorus and potassium. They have a seasonal high water table. Available water capacity is moderate, permeability is very slow, and runoff is slow.

Representative profile of Bartle silt loam in a cultivated field, 300 feet north and 2,100 feet west of the southeast corner of sec. 35, T. 3 S., R. 3 E.:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—9 to 12 inches, gray (10YR 5/1) silt loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; thick, coarse, platy structure; friable; slightly acid; abrupt, smooth boundary.

B1—12 to 18 inches, pale-brown (10YR 6/3) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; slightly acid; clear, smooth boundary.

B2t—18 to 28 inches, light-gray (10YR 7/2) heavy silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; thin grayish-brown (10YR 5/2) clay films on faces of some peds and as linings in voids; medium acid; clear, smooth boundary.

Bx1—28 to 48 inches, light brownish-gray (10YR 6/2) heavy silt loam; common, medium, distinct, brownish-yellow (10YR 6/6) mottles; strong, very coarse, prismatic structure; very firm; thin gray (10YR 5/1) clay films on faces of some peds; very strongly acid; gradual, smooth boundary.

Bx2g—48 to 60 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; strong, very coarse, prismatic structure; very firm; thin clay films or thin silt films on faces of some peds; very strongly acid; gradual, wavy boundary.

Cg—60 to 96 inches, gray (10YR 6/1) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; massive; firm; many very dark brown (10YR 2/2) concretions of manganese and iron oxide; very strongly acid; underlying strata of silt loam, silty clay loam, and less prominent layers of fine sandy loam.

The solum ranges from 42 to 60 inches in thickness. Depth to the fragipan is 24 to 36 inches.

The A1 horizon in wooded areas is 2 to 4 inches thick. It ranges from very dark grayish brown (10YR 3/2) to dark gray (10YR 4/1). The A2 horizon is 3 to 12 inches thick and ranges from gray (10YR 5/1) to light yellowish brown (10YR 6/4). In the dominant colors of the B horizon hue is 10YR or 2.5Y, value is 5 to 7, and chroma is 1 to 4. The Cg horizon ranges from silt loam to silty clay loam in texture and contains less prominent layers of fine sand and clay.

The Bartle soils are similar to Weinbach soils, but they contain less clay than Weinbach soils.

Bartle silt loam (0 to 2 percent slopes) (Ba).—This soil is in areas that are 3 to 20 acres in size. Included in mapping were areas of moderately sloping to moderately steep soils on short escarpments that separate this soil from lower lying soils on bottom lands. Also included were several areas of somewhat poorly drained soils in enclosed basins on uplands.

Wetness is the major limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. If this soil is drained, it is suited to the crops commonly grown in the county. It is not suited to alfalfa because the fragipan restricts root penetration. Capability unit IIw-3; woodland group 3w5.

Baxter Series

The Baxter series consists of deep, gently sloping to steep, well-drained soils on uplands. These soils formed in 0 to 20 inches of loess and underlying material weathered from cherty limestone. The native vegetation was mixed hardwoods.

In a representative profile (fig. 9) the surface layer is dark-brown silt loam about 2 inches thick. The subsurface layer is yellowish-brown silt loam about 6 inches thick. The subsoil is about 70 inches thick. The upper 5 inches is yellowish-brown, friable light silty clay loam

Figure 9.—**Profile of Baxter silt loam.**

and the lower 65 inches is red, firm and very firm cherty silty clay loam and cherty silty clay. The lower part has yellowish-brown mottles and is 20 to 40 percent chert fragments.

Baxter soils are moderate or low in content of organic matter and low in natural fertility. Available water capacity is high and permeability is moderate.

Representative profile of Baxter silt loam, 12 to 18 percent slopes, eroded, in a wooded area, 1,900 feet north and 1,300 feet east of the southwest corner of sec. 35, T. 1 S., R. 4 E.:

A1—0 to 2 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable; many roots; slightly acid; clear, smooth boundary.

A2—2 to 8 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, granular structure; friable; many roots; medium acid; clear, wavy boundary.

B1t—8 to 13 inches, yellowish-brown (10YR 5/6) light silty clay loam; weak, medium, subangular blocky structure; friable; thin strong-brown (7.5YR 5/6) clay films on faces of some peds; few roots; strongly acid; clear, wavy boundary.

IIB21t—13 to 20 inches, red (2.5YR 4/6) cherty silty clay loam; strong, medium, subangular and angular blocky structure; firm; thick yellowish-red (5YR 4/6) clay films on faces of all peds; 20 percent chert fragments; few roots; very strongly acid; gradual, wavy boundary.

IIB22t—20 to 45 inches, red (2.5YR 4/6) cherty silty clay; few, fine, faint, light yellowish-brown (10YR 6/4) mottles; strong, medium, angular and subangular blocky structure; very firm; thick yellowish-red (5YR 4/6) clay films on faces of all peds; thin reddish-brown (5YR 4/3) streaks on chert surfaces; 30 percent chert fragments; few roots; very strongly acid; gradual, wavy boundary.

IIB23t—45 to 60 inches, red (2.5YR 4/6) cherty silty clay; many, medium, distinct, light yellowish-brown (10YR 6/4) mottles; moderate, coarse, angular and subangular blocky structure; very firm; thick yellowish-red (5YR 4/6) clay films on faces of all peds; thin reddish-brown (5YR 4/3) streaks on many chert surfaces; 30 percent chert fragments; very strongly acid; gradual, wavy boundary.

IIB24t—60 to 78 inches, red (2.5YR 4/6) cherty silty clay or clay; many, medium, distinct, light yellowish-brown (10YR 6/4) mottles; moderate, medium and coarse, angular and subangular blocky structure; very firm; thick yellowish-red (5YR 4/6) clay films on faces of most peds; thin reddish-brown (5YR 4/3) streaks on chert surfaces; 40 percent chert fragments; very strongly acid.

The solum is 60 to 120 inches thick and commonly is the same as the depth to limestone bedrock. Depth of the loess ranges from 0 to 20 inches. Chert fragments range from 0 to 50 percent throughout the profile.

The A horizon is 6 to 12 inches thick. Where these soils are disturbed by plowing, they have an Ap horizon of yellowish-brown (10YR 5/4) to brown (7.5YR 5/4) silt loam or cherty silt loam, and where they are severely eroded they have an Ap horizon commonly of yellowish-red (5YR 5/6) silty clay loam or cherty silty clay loam. In the dominant colors of the B2 horizon hue is 2.5YR, 5YR, or 10R, value is 3 to 5, and chroma is 4 to 6. The B2 horizon ranges from cherty silty clay loam to cherty clay in texture. In some areas there is a red (2.5YR 4/6) cherty clay C horizon.

Baxter soils are similar to Hagerstown soils in color and texture, but unlike Hagerstown soils they have a cherty subsoil.

Baxter silt loam, 2 to 6 percent slopes, eroded (BcB2).—This soil is on ridgetops and in other areas on uplands. It has a profile similar to that described as representative for the series, except the surface layer is yellowish brown and about 2 inches thicker. Included in mapping were areas of slightly eroded soils.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to all crops commonly grown in the county. Capability unit IIe-3; woodland group 1o1.

Baxter silt loam, 6 to 12 percent slopes, eroded (BcC2).—This soil is on ridgetops and sides of shallow sinkholes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish brown and is about 2 inches thicker.

Included with this soil in mapping were a few areas of gently sloping Baxter soils that are eroded and a few areas of moderately sloping Baxter soils that are severely eroded. Also included were a few areas where loess ranges from 24 to 40 inches in depth and areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, small grain, meadow and pasture crops, tobacco, and popcorn. Capability unit IIIe-1; woodland group 1o1.

Baxter silt loam, 12 to 18 percent slopes, eroded (BcD2).—This soil is on sides of ridges and sides of deep sinkholes. It has the profile described as representative for the series.

Included with this soil in mapping were a few areas of slightly eroded soils and a few areas where slope is more than 18 percent. Also included were areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops, corn, small grain, and soybeans. Capability unit IVe-1; woodland group 1o1.

Baxter cherty silt loam, 6 to 12 percent slopes, eroded (BeC2).—This soil is on ridgetops and sides of shallow sinkholes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-brown cherty silt loam. Chert fragments make up 15 to 40 percent of the surface layer and upper part of the subsoil. In places the lower part of the subsoil is free of chert, but in other places it is more than 40 percent chert fragments.

Included with this soil in mapping were a few areas of gently sloping, eroded and moderately sloping, severely eroded Baxter soils. Also included were areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, tobacco, popcorn, and meadow and pasture crops. Capability unit IVe-8; woodland group 3o10.

Baxter cherty silt loam, 12 to 18 percent slopes, eroded (BeD2).—This soil is on sides of ridges and on sides of deep sinkholes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish brown. Chert fragments make up 15 to 40 percent of the surface layer and upper part of the subsoil. In places the lower part of the subsoil is free

of chert, but in other places it is up to 40 percent chert fragments.

Included with this soil in mapping were a few areas of slightly eroded soils and a few areas that slope more than 18 percent. Also included were areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to small grain and meadow and pasture crops. Capability unit VIe-1; woodland group 3o10.

Baxter cherty silt loam, 18 to 25 percent slopes, eroded (BeE2).—This soil is on sides of sinkholes in wooded areas. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-brown cherty silt loam and is about 2 inches thinner. Chert fragments make up 15 to 40 percent of the surface layer and upper part of the subsoil. In places the lower part of the subsoil is free of chert, but in other places it is up to 40 percent chert fragments. Limestone rock outcrops are indicated on the soil map by outcrop symbols.

Included with this soil in mapping were a few areas of slightly eroded soils and areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management.

This soil is suited to permanent pasture and trees. Capability unit VIe-1; woodland group 3o10.

Baxter cherty silt loam, 25 to 35 percent slopes, eroded (BeF2).—This soil is on sides of sinkholes in areas of karst topography. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-brown cherty silt loam and is about 2 inches thinner. Chert fragments make up 15 to 40 percent of the surface layer and upper part of the subsoil. In places the lower part of the subsoil is free of chert, but in other places it is up to 40 percent chert fragments.

Included with this soil in mapping were areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to trees, and can be used as wildlife habitat. If it is used for pasture, grazing needs to be controlled to prevent further erosion. Brush control is difficult where ordinary farm equipment cannot be operated safely because of steepness. Capability unit VIIe-1; woodland group 3o10.

Baxter silty clay loam, 2 to 6 percent slopes, severely eroded (BlB3).—This soil is on ridgetops and in other areas on uplands. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-red silty clay loam that was formerly material of the subsoil. Included in mapping were areas of eroded soils.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops, corn, popcorn, tobacco, soybeans, and small grain. Capability unit IIIe-1; woodland group 1o1.

Baxter silty clay loam, 6 to 12 percent slopes, severely eroded (BlC3).—This soil is on ridgetops and sides of shallow sinkholes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-red silty clay loam that was formerly material of the subsoil.

Included with this soil in mapping were a few areas of strongly sloping, eroded Baxter soils and areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops, tobacco, corn, and small grain. Capability unit IVe-1; woodland group 1o1.

Baxter cherty silty clay loam, 6 to 12 percent slopes, severely eroded (BmC3).—This soil is on ridgetops and sides of shallow sinkholes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-brown cherty silty clay loam that was formerly material of the subsoil. Chert fragments make up 15 to 40 percent of the surface layer and upper part of the subsoil. In places the lower part of the subsoil is free of chert, but in other places it is up to 40 percent chert fragments.

Included with this soil in mapping were a few areas of strongly sloping eroded Baxter soils and areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops, tobacco, corn, and small grain. Capability unit VIe-1; woodland group 3o10.

Baxter cherty silty clay loam, 12 to 18 percent slopes, severely eroded (BmD3).—This soil is on sides of ridges and sides of deep sinkholes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-red cherty silty clay loam that was formerly material of the subsoil. In places the lower part of the subsoil is free of chert, but in other places it is up to 40 percent chert fragments. Limestone rock outcrops are indicated on the soil map by outcrop symbols.

Included with this soil in mapping were areas of well-drained soils that formed in alluvium in basins of sinkholes. Also included were small areas of eroded and severely eroded soils that have slopes of less than 12 percent and more than 18 percent.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to permanent pasture and trees and can be used as wildlife habitat. If it is used for pasture, plant cover needs to be maintained at all times, and grazing needs to be controlled to prevent further erosion. This soil is suited to a nurse crop of oats when a pasture is being renovated. Brush in gullies can be removed, and the gullies shaped and reseeded. Capability unit VIIe-1; woodland group 3o10.

Baxter cherty silty clay loam, 18 to 25 percent slopes, severely eroded (BmE3).—This soil is on sides of sinkholes in areas of karst topography. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-red cherty silty clay loam that was formerly material of the subsoil. Chert fragments are 15 to 40 percent of the surface layer and upper subsoil. In places the lower subsoil is chert free, but in other places it is up to 40 percent chert frag-

ments. Limestone outcrops are indicated on the soil map by outcrop symbols.

Included with this soil in mapping were some areas of well-drained soils that formed in alluvium in basins of sinkholes.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to permanent pasture and trees and can be used as wildlife habitat. Small areas adjacent to less sloping soils are especially suited to wildlife habitat. Because this soil continues to erode if only sparsely covered by plants, the present plant cover should not be completely destroyed. Brush can be removed from pastured areas, however, and pastures can be renovated where feasible. If this soil is used for pasture, grazing needs to be controlled. Steepness and gullies make the use of ordinary farm equipment hazardous in places. Capability unit VIIe-1; woodland group 3o10.

Bedford Series

The Bedford series consists of deep, nearly level to gently sloping, moderately well drained soils on uplands. These soils have a fragipan in the subsoil. They formed in 20 to 40 inches of loess and underlying material weathered from cherty limestone (fig. 10). The native vegetation was mixed hardwoods.

In a representative profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 67 inches thick. The upper 6 inches is strong-brown friable silt loam, and the next 10 inches is yellowish-brown firm silty clay loam. The next 15 inches is a fragipan of dark-brown very firm silty clay loam that has gray mottles. The lower 36 inches of the subsoil is variegated red, yellow, and brown very firm silty clay and 10 to 15 percent chert fragments.

Bedford soils are moderate or low in content of organic matter and low in available phosphorus and potassium. Available water capacity is moderate, and permeability is very low.

Representative profile of Bedford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 510 feet east and 120 feet south of the northwest corner of sec. 33, T. 1 S., R. 4 E.:

Ap—0 to 9 inches, brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable; common roots; slightly acid; abrupt, smooth boundary.

B1—9 to 15 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, medium, subangular blocky structure; friable; few fine roots; strongly acid; clear, smooth boundary.

B21t—15 to 25 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; few fine roots; thin, patchy, strong-brown (7.5YR 5/6) clay films on faces of peds; common fine pores; very strongly acid; clear, irregular boundary.

Bx1—25 to 34 inches, dark-brown (7.5YR 4/4) light silty clay loam; common, medium, distinct, gray (10YR 6/1) and strong-brown (7.5YR 5/6) mottles; strong, very coarse, prismatic structure parting to strong, medium to coarse, angular blocky; very firm; thin gray (10YR 5/1) clay films on faces of some peds; very strongly acid; clear, wavy boundary.

I&IIBx2—34 to 40 inches, dark-brown (7.5YR 4/4) light silty clay loam; common, medium, distinct, gray (10YR 6/1) and strong-brown (7.5YR 5/6) mottles; strong, very coarse, prismatic structure parting to moderate, thick, platy; very firm; thin gray (10YR 5/1) clay films on faces of peds; 5 to 10 percent pebble-size chert fragments; very strongly acid; gradual, irregular boundary.

IIB22t—40 to 76 inches, variegated red (10YR 4/6), light yellowish brown (10YR 6/4), and brown (7.5YR 5/2) heavy silty clay; strong, medium and fine, angular blocky structure; very firm; thick gray (N 6/0) and light yellowish-brown (10YR 6/4) clay films on faces of all peds; 10 to 15 percent pebble-size chert fragments; very strongly acid.

The solum ranges from 48 to 96 inches in thickness. Depth to limestone bedrock ranges from 60 to 120 inches. Depth of the loess ranges from 20 to 40 inches. Depth to the fragipan ranges from 18 to 30 inches, and the thickness of the fragipan is 12 to 18 inches.

In wooded areas the A1 horizon is 2 to 4 inches thick and ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). The A2 horizon is 4 to 8 inches thick and ranges from brown (10YR 5/3) to yellowish brown 10YR 5/6). In the dominant colors of the B horizon hue is 10YR, 7.5YR, 2.5YR, or 10R, value is 4 to 6, and chroma is 3 to 6. The IIB22 horizon is silty clay or clay and is 5 to 15 percent chert fragments.

Figure 10.—**Profile of Bedford silt loam.**

Bedford soils are similar to Tilsit soils, but Bedford soils formed in part from finer textured weathered limestone material than these soils.

Bedford silt loam, 0 to 2 percent slopes (BnA).—This soil is in areas on ridgetops that range from 3 to 20 acres in size. The profile of this soil is siimlar to that described as representative for the series, except the surface layer is dark brown and about 2 inches thicker.

Included with this soil in mapping were a few small areas of Bartle silt loam.

Runoff is slow on this soil. Wetness early in spring is a limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIw-5; woodland group 3d9.

Bedford silt loam, 2 to 6 percent slopes, eroded (BnB2).—This soil is in areas along drainageways and on sides of broad ridgetops. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of Bedford silt loam, 0 to 2 percent slopes, and a few small areas that are wet and seepy.

Runoff is medium on this soil, and erosion is the major concern in use and management. Wetness early in spring is a limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIe-7; woodland group 3d9.

Bedford silt loam, 2 to 6 percent slopes, severely eroded (BnB3).—This soil is on ridgetops. The profile of this soil is similar to that described as representative for the series, except that the surface layer is mostly strong-brown subsoil material.

Included with this soil in mapping were a few small areas of Crider silt loam, 2 to 6 percent slopes, eroded. Also included were a few small gullies.

Runoff is rapid on this soil, and erosion is the major concern in use and management. Wetness early in spring is a limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa because the fragipan restricts root penetration. Capability unit IIIe-7; woodland group 3d9.

Berks Series

The Berks series consists of moderately deep, moderately steep to very steep, well-drained soils on uplands. They formed in material weathered from sandstone, siltstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown channery silt loam about 2 inches thick. The subsurface layer is dark yellowish-brown channery silt loam about 9 inches thick. The subsoil is yellowish-brown friable channery silt loam about 17 inches thick. The underlying material is brownish-yellow channery silt loam about 4 inches thick. The depth to hard sandstone bedrock is about 32 inches.

Berks soils are moderate in content of organic matter, low in available phosphorus, and medium in available potassium. Available water capacity is low, and permeability is moderate. Runoff is very rapid.

Representative profile of Berks channery silt loam in a wooded area of Gilpin-Berks complex, 18 to 30 percent slopes, 1,400 feet west and 2,100 feet south of the northeast corner of sec. 6, T. 3 S., R. 3 E.:

O1—1 to ½ inch, relatively undecomposed leaf litter.
O2—½ inch to 0, decomposed leaf litter.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) channery silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.
A2—2 to 11 inches, dark yellowish-brown (10YR 4/4) channery silt loam; moderate, medium, granular structure; friable; strongly acid; clear, smooth boundary.
B1—11 to 17 inches, yellowish-brown (10YR 5/6) channery silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.
B2—17 to 28 inches, yellowish-brown (10YR 5/6) channery silt loam; moderate, medium, subangular blocky structure; friable; very strongly acid; abrupt, smooth boundary.
C—28 to 32 inches, brownish-yellow (10YR 6/6) channery silt loam and weathered shale and fragments of sandstone; weak, coarse, subangular blocky structure; friable; very strongly acid; abrupt, smooth boundary.
R—32 inches, hard sandstone bedrock.

The solum ranges from 18 to 32 inches in thickness. Depth to sandstone bedrock ranges from 20 to 36 inches. Depth of the loess ranges from 0 to 20 inches. Fine-grained sandstone and shale and thin, flat siltstone fragments range from 15 to 50 percent in the A horizon, 35 to 50 percent in the B horizon, and 40 to 60 percent in the C horizon.

The A1 horizon is 1 to 3 inches thick and ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2). The A2 horizon is 3 to 10 inches thick and ranges from brown (10YR 5/3) to light yellowish brown (10YR 6/4). In the dominant colors of the B2 horizon hue is 7.5YR or 10YR, value is 4 to 6, and chroma is 4 to 6. In areas underlain by thick-bedded sandstone, the bedrock has numerous cracks and crevices that are filled with silt and sandy material to a depth ranging from 3 feet to more than 5 feet.

Berks soils are similar to Weikert soils, but Berks soils have a thicker B horizon and are deeper to bedrock than these soils.

Corydon Series

The Corydon series consists of shallow, moderately steep to very steep, well-drained, stony soils on uplands. They formed in material weathered from limestone. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown stony silt loam about 3 inches thick. The subsurface layer is dark-brown stony silt loam about 6 inches thick. The subsoil is very firm stony silty clay about 9 inches thick. The upper 7 inches is reddish brown and strong brown, and the lower 2 inches is yellowish brown and dark brown. The depth to hard limestone bedrock is about 18 inches.

Corydon soils are high in content of organic matter

and low in natural fertility. Available water capacity is low, and permeability is moderately slow. Runoff is rapid or very rapid. Limestone quarries are common throughout areas of Corydon soils (fig. 11).

Representative profile of Corydon stony silt loam, 20 to 60 percent slopes, in a wooded area, 2,500 feet east and 1,300 feet north of the southwest corner of sec. 2, T. 6 S., R. 3 E.:

O1—1 inch to 0, undecomposed and decomposed hardwood leaf litter.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) stony silt loam; moderate, medium, granular structure; friable; neutral; clear, smooth boundary.

A3—3 to 9 inches, dark-brown (10YR 3/3) stony silt loam; moderate, medium, granular structure; friable; neutral; clear, wavy boundary.

B2t—9 to 16 inches, reddish-brown (5YR 5/4) and strong-brown (7.5YR 5/6) stony silty clay; strong, medium, angular and subangular blocky structure; very firm; thick clay films on faces of all peds; slightly acid; clear, wavy boundary.

B3—16 to 18 inches, yellowish-brown (10YR 5/6) and dark-brown (7.5YR 4/4) silty clay; weak, subangular blocky structure; very firm; moderately alkaline (calcareous); abrupt, smooth boundary.

R—18 inches, hard limestone bedrock.

The solum is 10 to 20 inches thick, and thickness commonly is the same as the depth to limestone bedrock. Many flat limestone fragments make up as much as 15 percent of the soil material throughout the profile.

The A1 horizon is 1 to 4 inches thick and ranges from very dark gray (10YR 3/1) to dark brown (10YR 3/3). The A2 horizon is 6 to 10 inches thick and ranges from dark brown (10YR 3/3) to dark brown (7.5YR 3/2). In the dominant colors of the B horizon hue is 10YR, 7.5YR, and 5YR, value is 4 or 5, and chroma is 3 to 6. The B horizon ranges from silty clay loam to clay in texture.

Corydon soils are similar to Weikert soils, but they are less acid and have less channery rock than Weikert soils.

Corydon stony silt loam, 20 to 60 percent slopes (CoF).—This soil is characterized by limestone rock outcrops, which are indicated on the soil map by use of

Figure 11.—Limestone quarry in an area of Corydon soils.

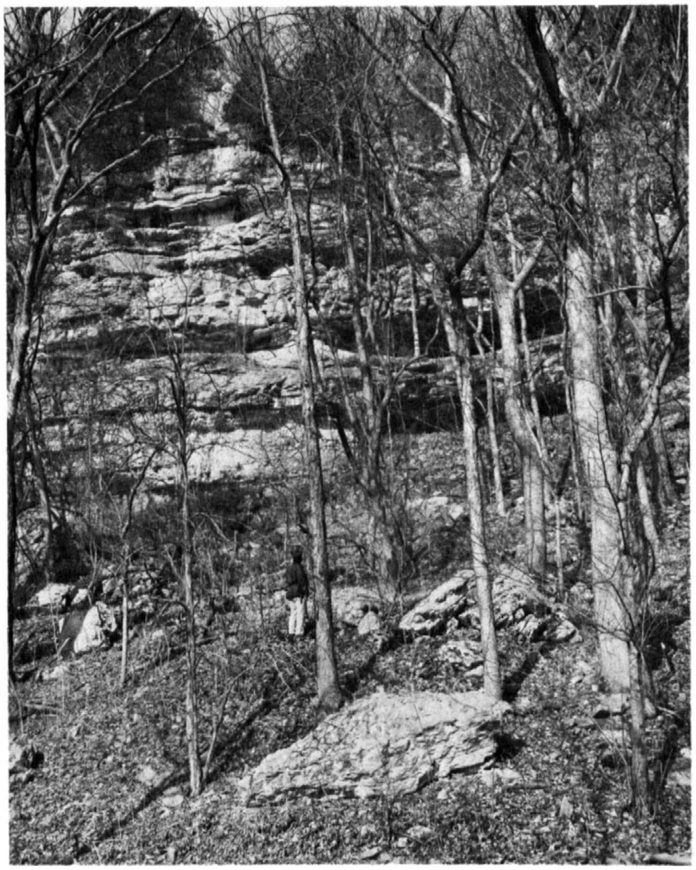

Figure 12.—Limestone outcrop on Corydon stony silt loam.

outcrop symbols (fig. 12). As much as 15 percent of this unit consists of soils that formed in colluvium on benches and are deeper than 20 inches to bedrock. Included in mapping were areas of eroded soils.

Runoff and erosion are major concerns in use and management. Shallowness, slope, and stoniness are limitations to use and management. This soil is suited to trees and grass and can be used as wildlife habitat. Capability unit VIIe-2; woodland group 3d7.

Crider Series

The Crider series consists of deep, gently sloping and moderately sloping, well-drained soils on uplands. They formed in 20 to 40 inches of loess and underlying material weathered from cherty limestone (fig. 13). The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 8 inches thick. The subsoil, which is about 62 inches thick, is strong-brown firm silty clay loam in the upper 18 inches. The lower 44 inches is variegated red, yellow, and brown very firm cherty silty clay and 5 to 10 percent chert fragments.

Crider soils are moderate in content of organic matter and in natural fertility. Available water capacity is high and permeability is moderate.

Representative profile of Crider silt loam, 6 to 12 percent slopes, eroded, in a cultivated field, 1,150 feet east and 2,300 feet north of the southwest corner of sec. 27, T. 5 S., R. 3 E.:

Figure 13.—Profile of Crider silt loam.

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1t—8 to 14 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; medium acid; clear, wavy boundary.

B21t—14 to 26 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular and angular blocky structure; firm; thin, patchy, dark-brown (7.5YR 4/4) clay films on faces of some peds; strongly acid; gradual, wavy boundary.

IIB22t—26 to 42 inches, variegated yellowish-red (5YR 5/6), red (2.5YR 4/6), and dark-brown (7.5YR 4/4) silty clay; moderate, medium, angular blocky structure; very firm; thick reddish-brown (5YR 4/4) clay films on faces of all peds; 5 to 10 percent chert fragments; strongly acid; gradual, wavy boundary.

IIB23t—42 to 70 inches, variegated yellowish-red (5YR 5/6), red (2.5YR 4/6), and dark-brown (7.5YR 4/4) silty clay; strong, medium, angular blocky structure; very firm; thick reddish-brown (5YR 4/4) clay films on faces of all peds; 5 to 10 percent chert fragments; very strongly acid.

The solum ranges from 40 to 100 inches in thickness. Depth to limestone bedrock ranges from 60 to 120 inches. Depth of the loess ranges from 20 to 40 inches. Chert fragments make up 0 to 20 percent of the IIB2 horizons.

The Ap horizon is 6 to 12 inches thick and ranges from dark brown (10YR 4/3) to yellowish-brown (10YR 5/6) silt loam. In areas of severely eroded soils the Ap horizon commonly is a dark-brown (7.5YR 4/4) mixture of silt loam and silty clay loam. In wooded areas the A1 horizon is 2 to 4 inches thick and ranges from very dark grayish brown 10YR 3/2) to dark brown (10YR 3/3). The A2 horizon is 4 to 8 inches thick and ranges from dark brown (10YR 4/3) to pale brown (10YR 6/3). In the dominant colors of the B2 horizon hue is 7.5YR, 5YR, 2.5YR, or 10R, value is 4 or 5, and chroma is 4 to 6. The B2 horizon ranges from silty clay loam to clay in texture.

Crider soils are similar to Hagerstown soils, but they have a thicker mantle of loess than Hagerstown soils.

Crider silt loam, 2 to 6 percent slopes, eroded (CrB2).—This soil is on narrow ridges and benches. It has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thicker.

Included with this soil in mapping were a few small areas of nearly level, slightly eroded soils. Also included were areas that have sinkholes.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, small grain, and meadow and pasture crops. It is especially suited to alfalfa. It is also suited to orchards. Capability unit IIe–3; woodland group 1o1.

Crider silt loam, 6 to 12 percent slopes, eroded (CrC2).—This soil is on ridgetops and benches. It has the profile described as representative for the series.

Included with this soil in mapping were small areas of severely eroded soils underlain by bedrock at depths of less than 36 inches. Also included were a few small areas of slightly eroded soils, mainly in wooded areas.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to small grain, corn, popcorn, soybeans, tobacco, alfalfa, and meadow and pasture crops. It is also suited to orchards. Capability unit IIIe–3; woodland group 1o1.

Crider soils, 2 to 6 percent slopes, severely eroded (CsB3).—These soils are on ridgetops and benches. They have a profile similar to that described as representative for the series, except the surface layer is a mixture of strong-brown silt loam and silty clay loam. Included in mapping were small areas of severely eroded soils that are underlain by bedrock at a depth of less than 36 inches. Also included were areas that have small gullies and areas that have sinkholes.

Runoff is rapid on these soils, and erosion and runoff are the major concerns in use and management. These soils are suited to small grain, meadow and pasture crops, corn, popcorn, tobacco, soybeans, and alfalfa. They are also suited to orchards. Capability unit IIIe–3; woodland group 1o1.

Crider soils, 6 to 12 percent slopes, severely eroded (CsC3).—These soils are on short irregular sides of ridges. They have a profile similar to that described as representative for the series, except the surface layer is a mixture of strong-brown silt loam and silty clay loam.

Included with these soils in mapping were areas of moderately sloping and strongly sloping eroded soils. Also included were areas that have small gullies and areas that have sinkholes. The gullies are indicated on the map by the symbol for gullies, and the sinkholes by the symbol for depressions.

Runoff is rapid on these soils, and erosion and runoff are the major concerns in use and management. These soils are suited to small grain, meadow and pasture crops, and alfalfa. They are also suited to orchards. Capability unit IVe–3; woodland group 1o1.

Elkinsville Series

The Elkinsville series consists of deep, nearly level to moderately sloping, well-drained soils on terraces. They formed in old mixed alluvium derived from loess-capped limestone, sandstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark yellowish-brown silt loam about 12 inches thick. The subsoil is about 50 inches thick. The upper 6 inches is yellowish-brown friable silt loam, and the next 30 inches is dark-brown and yellowish-brown firm silty clay loam. The lower 14 inches is yellowish-brown and pale-brown firm clay loam. The underlying material is stratified layers of yellowish-brown silt or sand and minor amounts of gravel.

Elkinsville soils are moderate in content of organic matter, low in available phosphorus, and medium in available potassium. Available water capacity is high, and permeability is moderate.

Representative profile of Elkinsville silt loam, 0 to 2 percent slopes, in a meadow, 1,300 feet north and 150 feet east of the southwest corner of sec. 23, T. 4 S., R. 4 E.:

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, thick, platy structure; friable; medium acid; clear, smooth boundary.

B1—12 to 18 inches, yellowish-brown (10YR 5/6) heavy silt loam; moderate, fine, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B21t—18 to 23 inches, dark-brown (7.5YR 4/4) and yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin reddish-brown (5YR 4/4) clay films on faces of most peds; strongly acid; clear, smooth boundary.

B22t—23 to 48 inches, yellowish-brown (10YR 5/4) and dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium to coarse, subangular blocky structure; firm; thin reddish-brown (5YR 4/4) clay films on faces of most peds; very strongly acid; clear, smooth boundary.

B3t—48 to 62 inches, yellowish-brown (10YR 5/6) and pale-brown (10YR 6/3) clay loam; weak, moderate, subangular blocky structure; firm; few strong-brown (7.5YR 5/6) clay films on faces of some peds; few black (10YR 2/1) concretions of manganese and iron oxide; very strongly acid; clear, wavy boundary.

C—62 to 75 inches, yellowish-brown (10YR 5/6) stratified silts, sands, and some gravel; massive; friable; very strongly acid.

The solum ranges from 42 to 72 inches in thickness. The A horizon is 8 to 16 inches thick. In areas disturbed by plowing the Ap horizon is grayish-brown (10YR 5/2) or dark yellowish-brown (10YR 4/4) silt loam. In severely eroded areas the Ap horizon commonly is yellowish-brown (10YR

5/4) heavy silt loam. In the dominant colors of the B horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 3 to 6. The B2 horizon is silt loam or silty clay loam, and the B3 horizon ranges from silty clay loam to sandy clay loam. In the dominant colors of the C horizon hue is 10YR, value is 4 or 5, and chroma is 3 or 4. This horizon commonly is mottled.

Elkinsville soils are similar to Wheeling soils, but they are more silty than Wheeling soils.

Elkinsville silt loam, 0 to 2 percent slopes (EIA).—This soil is in areas adjacent to drainageways and on bottom lands. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas where the soil is gently sloping. Also included were small areas of Elkinsville soils that have a surface layer of loam.

Runoff is slow on this soil. There are no major hazards or limitations to use and management. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. Capability unit I–1; woodland group 1o1.

Elkinsville silt loam, 2 to 6 percent slopes, eroded (EIB2).—This soil is on short slopes adjacent to drainageways and on bottom lands. It has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thinner.

Included with this soil in mapping were small areas of slightly eroded and severely eroded soils. Also included were a few areas of Elkinsville soils that have a surface layer of loam.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. Capability unit IIe–3; woodland group 1o1.

Elkinsville silt loam, 6 to 12 percent slopes, eroded (EIC2).—This soil is on short breaks along drainageways and on bottom lands. It has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thinner.

Included with this soil in mapping were small areas where the soil is only slightly eroded and areas of Elkinsville soils that have a surface layer of loam.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops, corn, soybeans, and small grain. Capability unit IIIe–3; woodland group 1o1.

Elkinsville silt loam, 6 to 12 percent slopes, severely eroded (EIC3).—This soil is on short breaks along drainageways and on bottom lands. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-brown heavy silt loam that was formerly subsoil material.

Included with this soil in mapping were small areas of strongly sloping soils. Also included were areas that have a few small gullies.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to small grain and meadow and pasture crops. Capability unit IVe–3; woodland group 1o1.

Gilpin Series

The Gilpin series consists of moderately deep, strongly sloping to steep, well-drained soils. These soils formed in 0 to 20 inches of loess and in the underlying material weathered from sandstone, siltstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown silt loam about 3 inches thick. The subsurface layer is pale-brown silt loam about 9 inches thick. It contains enough sand to have a gritty feel. The subsoil, about 17 inches thick, is 95 percent strong-brown friable heavy silt loam and 5 percent sandstone fragments. The depth to hard sandstone and shale is about 29 inches.

Gilpin soils are low or moderate in content of organic matter, low in available phosphorus, and medium in available potassium. Available water capacity is low and permeability is moderate.

Representative profile of Gilpin silt loam in a wooded area of Gilpin-Berks complex, 18 to 30 percent slopes; 100 feet west and 2,200 feet south of the northeast corner of sec. 1, T. 4 S., R. 2 E.:

O1—½ to ¼ inch, undecomposed leaf litter.

O2—¼ inch to 0, decomposed leaf litter.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

A2—3 to 12 inches, pale-brown (10YR 6/3) silt loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

Bt—12 to 29 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, medium, subangular blocky structure; friable; thin dark-brown (7.5 4/4) clay films on faces of peds and as linings in pores; about 5 percent sandstone fragments; very strongly acid; abrupt, smooth boundary.

R—29 inches, hard sandstone and shale bedrock.

The solum is 20 to 36 inches thick, and thickness commonly is the same as the depth to sandstone and shale bedrock. Depth of the loess ranges from 0 to 20 inches.

The A horizon is 8 to 14 inches thick. In areas disturbed by plowing the Ap horizon is dark grayish-brown (10YR 4/2), brown (10YR 5/3), or pale-brown (10YR 6/3) silt loam. In severely eroded areas the Ap horizon commonly is strong-brown (7.5YR 5/6) heavy silt loam. The A2 horizon commonly contains enough sand to give it a gritty feel. In the dominant colors of the Bt horizon hue is 7.5YR or 10YR, value is 4 to 6, and chroma is 4 to 6. The Bt horizon is heavy silt loam or silty clay loam. In areas underlain by thick-bedded sandstone, the bedrock has numerous cracks and crevices that are filled with silt and sandy material to a depth of 3 to more than 5 feet.

Gilpin soils are similar to Wellston soils, but they are shallower to bedrock and have a thinner B horizon than Wellston soils.

Gilpin silt loam, 12 to 18 percent slopes, eroded (GID2).—This soil is on short breaks at the head of draws and on sides of ridgetops. It has a profile similar to that described as representative for the series, except the surface layer is pale brown and about 2 inches thinner.

Included with this soil in mapping were a few areas of slightly eroded soils.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. The moderate soil depth limits the available water capacity, however, and lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to small grain and meadow and pasture crops. Capability unit VIe–1; woodland group 3o10.

Gilpin silt loam, 12 to 20 percent slopes, severely eroded (GID3).—This soil is on short breaks at the heads

of draws and on long sides of ridges. It has a profile similar to that described as representative for the series, except the surface layer is strong-brown heavy silt loam that was formerly subsoil material.

Included with this soil in mapping were areas that have many deep gullies. Sandstone or shale bedrock is exposed in the bottom of many gullies.

This soil is suited to meadow and pasture crops and to other less intensive uses. Runoff is very rapid, and erosion and runoff are the major concerns in use and management. The moderate soil depth limits the available water capacity, however, and lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. Capability unit VIIe-1; woodland group 3o10.

Gilpin silt loam, 18 to 25 percent slopes, eroded (GlE2).—This soil is on long sides of ridgetops and on benches surrounded by soils that are steep and very steep. It has a profile similar to that described as representative for the series, except the surface layer is pale brown and about 2 inches thinner.

Included with this soil in mapping were areas of slightly eroded soils.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. The moderate soil depth limits the available water capacity, however, and lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to trees and permanent pasture. Capability unit VIe-1; woodland group 3o10.

Gilpin-Berks complex, 18 to 30 percent slopes (GpF).—The soils in this complex are in areas that are generally 40 to 100 acres in size but in places are larger. Slopes are long, and runoff is rapid or very rapid. In places sandstone or limestone crops out on soils of this complex. These areas are indicated on the map by the symbol for rock outcrops.

About 45 percent of this complex is Gilpin silt loam, and 45 percent is Berks channery silt loam. The remaining 10 percent is other soils.

The Gilpin and Berks soils have the profiles described as representative of their respective series. The Berks soil contains more sandstone fragments than the Gilpin soil. Its slopes are in the upper part of the slope range.

Included with this complex in mapping are small areas of Weikert channery silt loam and of Corydon stony silt loam. Also included are small narrow areas of deep soils that formed in colluvium at the base of slopes. The soils that formed in colluvium contain large amounts of channery fragments and stones.

Runoff and erosion are the major concerns in use and management of soils in this complex. Slope, shallow or moderate depth of the soil, and channery fragments and stones are other concerns. These soils are suited to trees and grass, and they can be used as wildlife habitat. Capability unit VIIe-2; woodland group 3r12.

Gullied Land

Gullied land (Gu) is on uplands in areas that are mostly 3 to 15 acres in size but in places are as large as 40 acres. This land is generally underlain, at a depth of 2 to 6 feet, by bedrock of limestone, shale, or sandstone. Bedrock is exposed in the bottoms of gullies in many places. In areas where narrow ridges are between gullies, soils can be identified as those of the Baxter, Crider, Gilpin, Hagerstown, Wellston, Zanesville, and other series. Where areas are underlain by limestone or bedrock, the remaining soil material is mostly reddish clay that is very plastic. Where areas are underlain by sandstone or shale bedrock, the remaining soil material is mostly friable silt and some sand. Many channery fragments are present in the latter areas.

Runoff and erosion are the major concerns in use and management. Most of the land is barren, but in places shrubs, weeds, and wild grasses are growing. This land is suited to grasses, trees, and shrubs. Such vegetation helps to stabilize soil material, control runoff, and provide cover for wildlife. Many of the ridges between gullies are suited to pine trees (fig. 14). Capability unit VIIe-4; woodland group 4r3.

Hagerstown Series

The Hagerstown series consists of deep, moderately sloping to moderately steep, well-drained soils on uplands. They formed in 0 to 20 inches of loess and underlying material weathered from limestone. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark yellowish-brown silt loam about 6 inches thick. The subsoil is about 46 inches thick. The upper 5 inches is dark-brown firm silty clay loam. The next 5 inches is strong-brown firm silty clay loam, and the lower 36 inches is dark-red very firm silty clay. The depth to hard limestone is about 52 inches.

Hagerstown soils are moderate in content of organic matter and medium in natural fertility. Available water capacity is moderate or high, and permeability is moderate.

Representative profile of Hagerstown silt loam, 6 to 12 percent slopes, eroded, in a pasture, 2,300 feet east

Figure 14.—**Pine trees being planted in Gullied land.**

and 600 feet south of the northwest corner of sec. 6, T. 4 S., R. 3 E.:

Ap—0 to 6 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1t—6 to 11 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin reddish-brown (5YR 4/4) clay films on faces of some peds; strongly acid; clear, smooth boundary.

B21t—11 to 16 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; thin reddish-brown (5YR 4/4) clay films on faces of some peds; strongly acid; clear, wavy boundary.

IIB22t—16 to 46 inches, dark-red (2.5YR 3/6) silty clay; strong, medium, subangular and angular blocky structure; very firm; thin reddish-brown (2.5YR 4/4) clay films on faces of all peds; strongly acid; gradual, wavy boundary.

IIB23t—46 to 52 inches, dark-red (2.5YR 3/6) silty clay; strong, medium, subangular and angular blocky structure; very firm; thin reddish-brown (2.5YR 4/4) clay films on faces of all peds; common black (10YR 2/1) concretions of manganese and iron oxide; medium acid; abrupt, wavy boundary.

IIR—52 inches, hard limestone of high calcium carbonate equivalent and few or no chert fragments.

The solum is 30 to 60 inches thick, and thickness commonly is the same as the depth to limestone bedrock. Depth of the loess ranges from 0 to 20 inches. In areas disturbed by plowing, the Ap horizon is dark-brown (10YR 4/3), yellowish-brown (10YR 5/4), or dark yellowish-brown (10YR 4/4) silt loam. In severely eroded areas the Ap horizon commonly is strong-brown (7.5YR 5/6) silty clay loam. In wooded areas the A1 horizon is 2 to 4 inches thick and ranges from very dark grayish brown (10YR 3/2) to dark brown (7.5YR 3/2). The A2 horizon is 3 to 8 inches thick and ranges from dark brown (10YR 4/3) to brown (7.5YR 5/4). In the dominant colors of the B horizon hue is 10YR, 7.5YR, 5YR, 2.5YR, or 10R, value is 3 to 6, and chroma is 3 to 6. The B horizon ranges from silty clay loam to clay in texture. In some areas a C horizon of dark-red (2.5YR 3/6) silty clay or clay is present.

Hagerstown soils are similar to Baxter and Crider soils. They have a thinner mantle of loess than Crider soils, and unlike Baxter soils they have a noncherty profile.

Hagerstown silt loam, 6 to 12 percent slopes, eroded (HaC2).—This soil is on tops and sides of ridges. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of slightly eroded soils that have a thicker surface layer of silt loam than this soil.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, popcorn, tobacco, and small grain and to meadow and pasture crops. Capability unit IIIe-3; woodland group 1o1.

Hagerstown silt loam, 12 to 18 percent slopes, eroded (HaD2).—This soil is on sides of ridges. It has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thinner.

Included with this soil in mapping were a few small areas of slightly eroded soils and areas that have slopes of more than 18 percent.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops. If erosion is controlled, this soil is also suited to corn, small grain, and soybeans. Capability unit IVe-3; woodland group 1o1.

Hagerstown silt loam, 18 to 25 percent slopes, eroded (HaE2).—This soil is on sides of large limestone hills that are capped with sandstone and are 100 to 200 feet above the surrounding areas. It has a profile similar to that described as representative for the series, except the surface layer is about 4 inches thinner.

Included with this soil in mapping were areas of slightly eroded soils and areas less than one-half of an acre in size, of limestone rock outcrops (fig. 15).

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is not suited to row crops. It is suited to permanent pasture or trees and can be used as wildlife habitat. A large part of this acreage presently in trees is not eroded. To prevent severe erosion in areas used for pasture, grazing needs to be controlled and plant cover needs to be maintained. Brush, however, can be removed and pastures renovated where these measures are feasible. Steepness makes the use of ordinary farm equipment difficult in places. Capability unit VIe-1; woodland group 1r2.

Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded (HgC3).—This soil is on tops and sides of ridges. It has a profile similar to that described as representative for the series, except the surface layer is silty clay loam.

Included with this soil in mapping were a few areas of strongly sloping eroded soils.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops. If erosion is controlled, it is also suited to small grain, corn, and tobacco. Capability unit IVe-3; woodland group 1o1.

Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded (HgD3).—This soil is on sides of ridges. It has a profile similar to that described as representative for the series, except the surface layer is silty clay loam. Included in mapping were a few areas of eroded soils.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops. If erosion is controlled, it is also suited to small grain. Capability unit VIe-1; woodland group 1o1.

Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded (HgE3).—This soil is on sides of large limestone hills, capped with sandstone, rising 100 to 200 feet above the surrounding areas. It has a profile similar to that described as representative for the series, except the surface layer is strong-brown silty clay loam.

Included with this soil in mapping were areas of eroded soils and small areas, less than one-half of an acre in size, of limestone rock outcrops.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is not suited to row crops. It is suited to permanent pasture or trees and can be used as wildlife habitat. This soil continues to erode if only sparsely covered by plants, so the present plant cover should not be completely destroyed, although brush can be removed from pastured areas and pastures can be renovated where these measures are feasible. Grazing needs to be controlled in areas used for pastures. Gullies and moderate steepness make the use of ordinary farm equipment hazard-

Figure 15.—**Limestone outcrops on Hagerstown silt loam.**

ous in places. Capability unit VIe–1; woodland group 1r2.

Haymond Series

The Haymond series consists of deep, nearly level, well-drained soils on bottom lands and in basins of sinkholes in uplands. They formed in mixed alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 9 inches thick. The subsoil is dark yellowish-brown friable silt loam about 17 inches thick. The underlying material is dark yellowish-brown stratified silt loam that contains less prominent layers of loam.

Haymond soils are moderate in content of organic matter, low in available phosphorus, and medium in available potassium. Available water capacity is high, and permeability is moderate. Runoff is slow.

Representative profile of Haymond silt loam in a cultivated field, 2,300 feet east and 1,200 feet south of the northwest corner of sec. 4, T. 4 S., R. 3 E.:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B—9 to 26 inches, dark yellowish-brown (10YR 4/4) silt loam, brown (10YR 5/3) when crushed; weak, medium, subangular blocky structure parting to granular; friable; thin very dark grayish-brown (10YR 3/2) organic films on faces of peds; neutral; clear, smooth boundary.

C—26 to 60 inches, dark yellowish-brown (10YR 4/4) stratified silt loam that contains less prominent layers of loam; massive; friable; neutral.

The solum ranges from 24 to 40 inches in thickness. The Ap horizon is 8 to 12 inches thick. It ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). In the dominant colors of the B horizon hue is 10YR, value is 4 or 5, and chroma is 3 to 6. In places the C horizon, below a depth of about 36 inches, is stratified with less prominent layers of sandy material.

Haymond soils are similar to Huntington soils, but they have a lighter surface horizon than Huntington soils.

Haymond silt loam (Hm).—This soil is in long, narrow areas on bottom lands and in basins of sinkholes on uplands.

Included with this soil in mapping were small areas of gently sloping soils along sloughs and streambanks. Also included were a few small areas of soils that have mottles at a depth of 20 to 30 inches.

Flooding between December and June is the major concern in use and management. This soil is suited to corn, soybeans, and meadow and pasture crops. Small grain and legumes are subject to severe damage if flooding is prolonged. Capability unit I-2; woodland group 1o8.

Huntington Series

The Huntington series consists of deep, nearly level, well-drained soils on bottom lands. They formed in recent mixed alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is silt loam about 22 inches thick. It is very dark grayish brown in the upper part and dark brown in the lower part. The subsoil is dark-brown friable silt loam about 40 inches thick.

Huntington soils are high in content of organic matter, high in available phosphorus, and medium in available potassium. Available water capacity is high, and permeability is moderate. Runoff is slow.

Representative profile of Huntington silt loam in a cultivated field, 2,280 feet west and 100 feet south of the northeast corner of sec. 13, T. 5 S., R. 5 E.:

Ap—0 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; many fine pores; neutral; abrupt, smooth boundary.

A12—12 to 22 inches, dark-brown (10YR 3/3) silt loam; weak, coarse, subangular blocky structure parting to weak, fine granular; friable; very dark grayish-brown (10YR 3/2) organic films on faces of most peds; many fine pores; neutral; clear, smooth boundary.

B2—22 to 36 inches, dark-brown (10YR 4/3) silt loam; weak, medium and coarse, subangular blocky structure parting to medium granular; friable; very dark grayish-brown (10YR 3/2) organic films on faces of most peds; many fine pores; neutral; clear, smooth boundary.

B3—36 to 62 inches, dark-brown (10YR 4/3) heavy silt loam; weak, medium, subangular blocky structure parting to medium granular; friable; dark-brown (10YR 3/3) organic films on faces of most peds; many fine pores; neutral.

The solum ranges from 40 to 70 inches in thickness. The A horizon is 10 to 24 inches thick and ranges from very dark gray (10YR 3/1) to dark brown (10YR 3/3). In the dominant colors of the B horizon hue is 10YR or 7.5YR, value is 4 or 5, and chroma is 3 or 4. The B2 horizon is silt loam or silty clay loam in texture.

Huntington soils are similar to Haymond soils, but they have darker surface horizons than Haymond soils.

Huntington silt loam (Hu).—This nearly level soil is in areas between sloughs along the Ohio River. New soil material is occasionally deposited during seasonal flooding.

Included with this soil in mapping were a few small areas of moderately well drained soils. Also included were areas of gently sloping soils along sloughs and steep soils on short breaks along the Ohio River.

Flooding is a concern in use and management. This soil is suited to corn, soybeans, and meadow and pasture crops. Small grain and alfalfa are subject to severe damage if flooding is prolonged. Capability unit I-2; woodland group 1o8.

Johnsburg Series

The Johnsburg series consists of deep, nearly level, somewhat poorly drained soils on uplands. These soils have a fragipan in the subsoil. They formed in 20 to 40 inches of loess and underlying material weathered from sandstone, siltstone, or shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 6 inches thick. The subsurface layer is brown to pale-brown silt loam about 5 inches thick. The subsoil is about 37 inches thick. The upper 5 inches is yellowish-brown friable silt loam that has light-gray mottles. The next 6 inches is yellowish-brown firm silty clay loam that has grayish-brown mottles. Below this is a 16-inch fragipan of pale-brown very firm heavy silt loam that has light-gray mottles. The lower 10 inches of the subsoil is pale-brown firm silty clay loam that has light-gray mottles. The underlying material is yellowish-brown sandy clay loam about 45 inches thick. The depth to sandstone bedrock is about 93 inches.

Johnsburg soils are low in content of organic matter and low in available phosphorus and potassium. They have a seasonal high water table. Available water capacity is high, and permeability is very slow. Runoff is slow.

Representative profile of Johnsburg silt loam in a cultivated field, 1,100 feet north and 500 feet west of the southeast corner of sec. 24, T. 2 S., R. 2 E.:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—6 to 11 inches, brown (10YR 5/3) to pale-brown (10YR 6/3) silt loam; weak, medium, platy structure; friable; strongly acid; clear, smooth boundary.

B1—11 to 16 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, medium, distinct, light-gray (10YR 7/2) mottles; weak, medium, subangular blocky structure; friable; thin dark yellowish-brown (10YR 4/4) silt films on faces of most peds; very strongly acid; clear, smooth boundary.

B2t—16 to 22 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; thin, discontinuous, grayish-brown (10YR 5/2) clay films on faces of most peds; very strongly acid; clear, wavy boundary.

Bxt—22 to 38 inches, pale-brown (10YR 6/3) heavy silt loam; many, medium, distinct, light-gray (10YR 7/2) mottles; strong, very coarse, prismatic structure; very firm; thin brown (7.5YR 5/2) clay films on faces of some peds; very strongly acid; clear, wavy boundary.

IIB3t—38 to 48 inches, pale-brown (10YR 6/3) silty clay loam; common, medium, distinct, light-gray (10YR 7/2) mottles; weak, coarse, subangular blocky structure; firm; thin brown (7.5YR 5/2) clay films on faces of some peds; some fine sand grains; very strongly acid; clear, wavy boundary.

IIC—48 to 93 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, medium, distinct, light-gray (10YR 7/2) mottles; massive; firm; extremely acid; abrupt, wavy boundary.

IIR—93 inches, sandstone bedrock.

The solum ranges from 42 to 60 inches in thickness. Depth to sandstone bedrock ranges from 48 to 96 inches. Thickness of the loess ranges from 20 to 40 inches. Depth to the fragipan ranges from 18 to 30 inches. The fragipan formed in loess or loess and material weathered from sandstone, siltstone, and shale.

In wooded areas the A1 horizon is 1 to 3 inches thick and ranges from dark gray (10YR 4/1) to very dark grayish brown (10YR 3/2). The A2 horizon is 4 to 10 inches thick and ranges from grayish brown (10YR 5/2) to light yellowish brown (10YR 6/4). In the dominant colors of the B2t horizon hue is 10YR, value is 4 to 6, and chroma is 2 to 6. This horizon is silt loam or silty clay loam. The Bx horizon is 10 to 24 inches thick. In the dominant colors of the Bx horizon hue is 10YR or 7.5YR, value is 4 to 7, and chroma is 2 to 6. This horizon is silt loam or silty clay loam. In the dominant colors of the IIC horizon hue is 10YR, value is 4 to 6, and chroma is 4 to 8. The IIC horizon ranges from loam to sandy clay loam in texture.

Johnsburg soils are similar to Bartle soils, but they are more strongly acid in the horizons above the fragipan.

Johnsburg silt loam (0 to 2 percent slopes) (Jo).—This soil is in long and narrow areas that are mainly 3 to 10 acres in size. Included in mapping were a few small areas of gently sloping eroded soils.

Wetness is the major limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. If a suitable drainage system is established and maintained, this soil is suited to corn, soybeans, and small grain. It is also suited to meadow and pasture. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIIw-3; woodland group 3w5.

Markland Series

The Markland series consists of deep, gently sloping to very steep, well drained and moderately well drained soils on terraces. They formed in moderately alkaline lacustrine material. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 3 inches thick. The subsurface layer is dark-brown silt loam about 4 inches thick. The subsoil is about 23 inches thick. The upper 4 inches is yellowish-brown firm silty clay loam, and the lower 19 inches is brown very firm silty clay. The underlying material is yellowish-brown stratified silty clay and silty clay loam that has less prominent layers of silt loam.

Markland soils are moderate or low in content of organic matter and low in natural fertility. Available water capacity is high, and permeability is slow.

Representative profile of Markland silt loam, 25 to 70 percent slopes, in a wooded area, 100 feet east and 1,600 feet south of the northwest corner of sec. 31, T. 4 S., R. 3 E.:

O1—½ inch to 0, partly decomposed leaves.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; common roots; slightly acid; abrupt, smooth boundary.

A2—3 to 7 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; common roots; slightly acid; clear, smooth boundary.

B1t—7 to 11 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on faces of some peds; common roots; medium acid; clear, smooth boundary.

IIB21t—11 to 20 inches, brown (10YR 5/3) silty clay; strong angular blocky structure; very firm; thin dark yellowish-brown (10YR 4/4) clay films on faces of all peds; few roots; strongly acid; clear, wavy boundary.

IIB22t—20 to 30 inches, brown (10YR 5/3) silty clay; strong, medium, angular blocky structure; very firm; thin pale-brown (10YR 6/3) silt films on faces of some peds and as linings in voids; thin, discontinuous, dark yellowish-brown (10YR 4/4) clay films on faces of some peds; few roots; medium acid; clear, wavy boundary.

IIC—30 to 72 inches, yellowish-brown (10YR 5/4) stratified silty clay and silty clay loam with less prominent layers of silt loam; many, medium, distinct, dark yellowish-brown (10YR 4/4) and light brownish-gray (10YR 6/2) mottles; massive; firm; few roots; many accumulations of lime in fine, soft, rounded masses; moderately alkaline (calcareous).

The solum ranges from 20 to 40 inches in thickness. Thickness of the loess ranges from 0 to 12 inches. The A horizon is 4 to 8 inches thick. In areas disturbed by plowing, the Ap horizon is dark grayish-brown (10YR 4/2) or dark-brown (10YR 4/3) silt loam. In severely eroded areas the Ap horizon commonly is yellowish-brown (10YR 5/4) silty clay loam. In the dominant colors of the B2 horizon hue is 10YR to 2.5YR, value is 4 to 6, and chroma is 3 or 4. The B2 horizon is silty clay or clay. In the dominant colors of the IIC horizon hue is 10YR, 2.5Y, or 5Y, value is 4 to 6, and chroma is 3 to 6. Soft lime accumulations in the IIC horizon range from none to many.

Markland soils are similar to McGary soils, but they differ from McGary soils in having a browner subsoil and no mottles above a depth of 20 inches.

Markland silt loam, 2 to 6 percent slopes, eroded (MaB2).—This soil is on benches above bottom lands of tributary streams of the Ohio River. It has a profile similar to that described as representative for the series, except the surface layer is dark brown and about 4 inches thicker.

Included with this soil in mapping were a few small areas of nearly level soils.

Runoff is medium on this soil, and erosion is a concern in use and management. This soil is suited to corn, soybeans, small grain, alfalfa, and meadow and pasture crops. Capability unit IIIe-11; woodland group 3r18.

Markland silt loam, 8 to 18 percent slopes, eroded (MaD2).—This soil is in areas along drainageways and on short narrow breaks along major streams. It has a profile similar to that described as representative for the series, except the surface layer is dark-brown heavy silt loam and is about 2 inches thicker.

Included with this soil in mapping were a few small areas of slightly eroded soils.

Runoff is medium or rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to alfalfa, meadow, permanent pasture, and trees. Capability unit VIe-1; woodland group 3r18.

Markland silt loam, 25 to 70 percent slopes (MaF).—This soil is in areas along drainageways and on short narrow breaks along major streams. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of severely eroded soils.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This

soil is suited to trees and grass and can be used as wildlife habitat. Capability unit VIIe-1; woodland group 3r18.

Markland silty clay loam, 8 to 18 percent slopes, severely eroded (McD3).—This soil is on short slopes and breaks above bottom lands. It has a profile similar to that described as representative for the series, except the surface layer is yellowish-brown silty clay loam.

Included in mapping were a few small areas of soils that have a silty clay surface layer and a few small areas of eroded soils. Also included were areas that have a few gullies.

Runoff is rapid or very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to trees and grass and can be used as wildlife habitat. Capability unit VIIe-1; woodland group 3r18.

McGary Series

The McGary series consists of deep, nearly level, somewhat poorly drained soils on terraces. They formed in calcareous lacustrine material. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is grayish-brown silt loam about 8 inches thick. The subsoil is about 37 inches thick. The upper 6 inches is grayish-brown and yellowish-brown firm silty clay loam, and the next 16 inches is yellowish-brown and grayish-brown very firm silty clay. The lower 15 inches is gray very firm silty clay that has dark brown mottles. The underlying material is gray silty clay loam.

McGary soils are low in content of organic matter, low in available phosphorus, and medium in available potassium. They have a seasonal high water table. Available water capacity is high, and permeability is slow to very slow. Runoff is slow.

Representative profile of McGary silt loam in a pasture, 100 feet east and 1,900 feet south of the northwest corner of sec. 31, T. 4 S., R. 3 E.:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

B21t—8 to 14 inches, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, angular blocky structure; firm; thin gray (10YR 5/1) clay films on faces of some peds; common black (10YR 2/1) concretions of manganese and iron oxide; very strongly acid; clear, smooth boundary.

IIB22t—14 to 30 inches, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) silty clay; weak, medium to coarse, angular blocky structure; very firm; thin gray (10YR 5/1) clay films on faces of some peds; common black (10YR 2/1) concretions of manganese and iron oxide; medium acid; clear, wavy boundary.

IIB23tg—30 to 45 inches, gray (10YR 5/1) silty clay; common, medium, distinct, dark-brown (10YR 4/3) mottles; strong, medium, angular blocky structure; very firm; thin gray (10YR 5/1) clay films on faces of some peds; common black (10YR 2/1) concretions of manganese and iron oxide; thin dark-brown (7.5YR 4/4) films on faces of some peds; slightly acid in the upper part and mildly alkaline in the lower part; clear, wavy boundary.

IICg—45 to 72 inches, gray (10YR 5/1) silty clay loam; common, medium, distinct, dark-brown (10YR 4/3) mottles; massive; firm; many accumulations of lime in fine soft rounded masses; moderately alkaline (calcareous).

The solum ranges from 24 to 50 inches in thickness. Thickness of the loess ranges from 0 to 14 inches.

In wooded areas the A1 horizon is 2 to 4 inches thick and ranges from dark gray (10YR 4/1) to dark grayish brown (10YR 4/2). The A2 horizon is 4 to 8 inches thick and ranges from dark brown (10YR 4/3) to pale brown (10YR 6/3). In the dominant colors of the B2 horizon hue is 10YR, value is 4 to 6, and chroma is 1 to 6. The B2 horizon ranges from silty clay loam to clay loam in texture. The IICg horizon is stratified clay, silty clay, silty clay loam, and thin layers of silt loam. Soft lime accumulations in the IICg horizon range from none to many.

McGary soils are similar to Markland soils, but they differ from Markland soils in having a grayer subsoil and mottles above a depth of 20 inches.

McGary silt loam (0 to 2 percent slopes) (Mg).—This soil is on terraces. Included with it in mapping were a few small areas of gently sloping eroded soils and areas where there is a loess cap more than 14 inches thick.

Wetness is the major limitation to use and management. If a suitable drainage system is established and maintained, this soil is suited to corn, soybeans, and small grain. It is also suited to meadow and pasture crops. It is not suited to alfalfa because of excessive moisture in the lower layers in winter and early in spring. Capability unit IIIw-6; woodland group 3w5.

Montgomery Series

The Montgomery series consists of deep, nearly level and depressional, very poorly drained soils on uplands and terraces. They formed in waterlaid clays. The native vegetation was mixed hardwoods, swamp grass, and sedges.

In a representative profile the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer is very dark gray silty clay about 7 inches thick. The subsoil is about 23 inches thick. The upper 8 inches is dark-gray and grayish-brown very firm silty clay. The lower 15 inches is grayish-brown firm silty clay loam that has light olive-brown mottles. It contains enough sand to give it a gritty feel. The underlying material is yellowish-brown clay loam.

Montgomery soils are high in content of organic matter and medium to high in available phosphorus and potassium. They have a seasonal high water table. Available water capacity is high, and permeability is slow to very slow. Runoff is very slow on nearly level slopes to ponded in depressions.

Representative profile of Montgomery silty clay loam in a cultivated field, 1,100 feet east and 100 feet north of the southwest corner of sec. 11, T. 4 S., R. 5 E.:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silty clay loam; moderate, coarse, granular structure; firm; neutral; abrupt, smooth boundary.

A12—9 to 16 inches, very dark gray (10YR 3/1) silty clay; moderate, medium, angular and subangular blocky structure; very firm; neutral; abrupt, smooth boundary.

B21tg—16 to 24 inches, dark-gray (10YR 4/1) and grayish-brown (2.5Y 5/2) silty clay; moderate, medium, subangular and angular blocky structure; very firm; thin dark-gray (10YR 4/1) clay films on faces of most peds; neutral; clear, smooth boundary.

B22t—24 to 39 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, distinct, light olive-brown

2.5Y 5/4) mottles; moderate, coarse, subangular blocky structure; firm; thin dark-gray (10YR 4/1) clay films on faces of many peds; neutral; clear, smooth boundary.

C—39 to 60 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; massive; firm; neutral.

The solum ranges from 30 to 48 inches in thickness. The A horizon is 10 to 16 inches thick and ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). In the dominant colors of the B2 horizon hue is 10YR, 2.5Y, or 5Y, value is 4 to 6, and chroma is 1 to 6. This horizon is silty clay loam or silty clay. In places the B2 horizon contains enough sand to give it a gritty feel. In the dominant colors of the C horizon hue is 10YR or 2.5Y, value is 4 to 6, and chroma is 1 to 6. The C horizon is silty clay loam or clay loam and ranges from neutral to moderately alkaline.

Montgomery soils are not similar to other soils in this county.

Montgomery silty clay loam (0 to 2 percent slopes) (Mo).—This soil is in areas that are 3 to 10 acres in size. Depressions are present in places.

Included with this soil in mapping were a few small areas that have 4 to 10 inches of light-colored silt loam alluvium over the original black surface layer.

Wetness is the major limitation to use and management. If a suitable drainage system is established and maintained, this soil is suited to corn, soybeans, and small grain. It is also suited to meadow and pasture. It is not suited to alfalfa because of excessive moisture in the lower layers in winter and early in spring. Capability unit IIw–1; woodland group 2w11.

Newark Series

The Newark series consists of deep, nearly level, somewhat poorly drained soils on bottom lands and in basins of sinkholes in uplands. They formed in mixed alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-gray silt loam about 3 inches thick. The subsoil is friable silt loam about 33 inches thick. The upper 15 inches is pale brown and has mottles of light brownish gray, yellowish brown, and yellowish red. The lower 18 inches is grayish brown and has mottles of pale brown, brownish yellow, and dark brown. The underlying material is grayish-brown silt loam.

Newark soils are low in content of organic matter and available phosphorus and medium in available potassium. They have a seasonal high water table. Available water capacity is high, and permeability is moderate. Runoff is slow.

Representative profile of Newark silt loam in a wooded area, 100 feet south and 2,500 feet west of the northeast corner of sec. 9, T. 5 S., R. 4 E.:

O1—1 inch to 0, decomposed and undecomposed hardwood leaf litter.

A1—0 to 3 inches, dark-gray (10YR 4/1) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B21—3 to 18 inches, pale-brown (10YR 6/3) silt loam; many, medium, distinct, light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and yellowish-red (5YR 5/8) mottles; moderate, medium, granular structure; friable; few very dark grayish-brown (10YR 3/2) concretions of manganese and iron oxide; slightly acid; clear, smooth boundary.

B22—18 to 36 inches, grayish-brown (10YR 5/2) silt loam; many, medium, distinct, pale-brown (10YR 6/3), brownish-yellow (10YR 6/8), and dark-brown (7.5YR 4/4) mottles; weak, coarse, subangular blocky structure; friable; few dark grayish-brown (10YR 3/2) concretions of manganese and iron oxide; medium acid; clear, wavy boundary.

C—36 to 60 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) and pale-brown (10YR 6/3) mottles; massive; friable; few very dark grayish-brown (10YR 3/2) concretions of manganese and iron oxide; medium acid.

The solum ranges from 20 to 40 inches in thickness. In areas disturbed by plowing these soils have an Ap horizon that is 8 to 12 inches thick and ranges from dark brown (10YR 4/3) to yellowish brown (10YR 5/4). In the dominant colors of the B2 horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 2 to 8. In the dominant colors of the C horizon hue is 10YR, value is 4 to 6, and chroma is 2 to 6. The C horizon is silt loam or silty clay loam that has less prominent layers of loam, fine sandy loam, or silty clay.

Newark soils are similar to Haymond and Huntington soils, but Newark soils have a grayer subsoil than these soils.

Newark silt loam (Ne).—This nearly level soil is in narrow areas along streams and in small round areas in basins of sinkholes in uplands.

Included with this soil in mapping were a few small areas of poorly drained soils. Also included were areas along the Ohio River where this soil has a higher clay content than that found in other areas.

Wetness is a limitation, and flooding is a concern in use and management. If a suitable drainage system is established and maintained, this soil is suited to corn and soybeans. It is also suited to meadow and pasture. Small grain and alfalfa are subject to severe damage if flooding is prolonged. Capability unit IIw–7; woodland group 2w13.

Pekin Series

The Pekin series consists of deep, nearly level and gently sloping, moderately well drained soils on terraces. These soils have a fragipan in the lower part of the subsoil. They formed in silty alluvium over stratified material. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 12 inches thick. The subsoil is about 37 inches thick. The upper 7 inches is yellowish-brown friable silt loam. The next 12 inches is yellowish-brown firm light silty clay loam that has grayish-brown mottles. The lower 18 inches of the subsoil is a fragipan of pale-brown very firm heavy silt loam that has grayish-brown and light brownish-gray mottles. The underlying material is light-gray stratified silty clay loam, silt loam, loam, and sand.

Pekin soils are moderate in content of organic matter and low in available phosphorus and potassium. Available water capacity is moderate, and permeability is very slow.

Representative profile of Pekin silt loam, 0 to 2 percent slopes, in a cultivated field, 3,100 feet west and 1,550 feet north of the southeast corner of sec. 19, T. 3 S., R. 4 E.:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; common roots; neutral; abrupt, smooth boundary.

A2—8 to 12 inches, dark-brown (10YR 4/3) silt loam; weak, medium, platy structure; friable; common roots; slightly acid; clear, smooth boundary.

B1—12 to 19 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, platy structure; friable; few roots; very strongly acid; clear, smooth boundary.

B2t—19 to 31 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm; thin dark-brown (7.5YR 4/4) clay films on faces of some peds; very strongly acid; gradual, wavy boundary.

Bx—31 to 49 inches, pale-brown (10YR 6/3) heavy silt loam; many, medium, faint, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) mottles; strong, very coarse, prismatic structure, massive inside peds; very firm; yellowish brown (10YR 5/6) on faces of some peds; few very dark brown (10YR 2/2) concretions of manganese and iron oxide; thin dark-brown (7.5YR 4/4) clay films on faces of some peds; very strongly acid; gradual, smooth boundary.

IIC—49 to 84 inches, light-gray (10YR 7/2) stratified silty clay loam, silt loam, loam, and sand; moderate, medium, distinct, brown (10YR 5/3) and strong-brown (7.5YR 4/6) mottles; massive; friable; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to the fragipan ranges from 18 to 36 inches.

In wooded areas the A1 horizon is 2 to 4 inches thick and ranges from very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2). The A2 horizon is 4 to 10 inches thick and ranges from dark brown (10YR 4/3) to pale brown (10YR 6/3). In the dominant colors of the B horizon hue is 10YR, value is 4 to 6, and chroma is 2 to 6. This horizon is heavy silt loam or silty clay loam. In the dominant colors of the IIC horizon hue is 10YR or 7.5YR, value is 4 to 7, and chroma is 2 to 6.

Pekin soils are similar to Bartle soils, but they have a browner subsoil than Bartle soils.

Pekin silt loam, 0 to 2 percent slopes (PeA).—This soil is in areas that are long and narrow. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of a soil that has a loam or fine sandy loam surface layer.

Runoff is slow on this soil, and wetness early in spring is a limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIw-5; woodland group 3d9.

Pekin silt loam, 2 to 6 percent slopes, eroded ((PeB2).—Areas of this soil are long and narrow. Slopes are short. This soil has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thinner.

Included with this soil in mapping were a few areas of severely eroded soils and areas of moderately sloping soils.

Runoff is medium on this soil, and erosion is the major concern in use and management. Wetness early in spring is a limitation. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIe-7; woodland group 3d9.

Princeton Series

The Princeton series consists of deep, moderately sloping and strongly sloping, well-drained soils on uplands. They formed in wind-deposited sands and coarse silts. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown fine sandy loam about 7 inches thick. The subsurface layer is dark yellowish-brown fine sandy loam about 4 inches thick. The subsoil is about 46 inches thick. The upper 20 inches is dark-brown and strong-brown firm sandy clay loam. The lower 26 inches is strong-brown and yellowish-brown firm fine sandy loam. The underlying material is dark yellowish-brown very fine sand.

Princeton soils are moderate in content of organic matter, low in available phosphorus, and medium in available potassium. Available water capacity and permeability are moderate.

Representative profile of Princeton fine sandy loam, 6 to 12 percent slopes, eroded, in a cultivated field, 1,700 feet south and 100 feet west of the northeast corner of sec. 4, T. 6 S., R. 3 E.:

Ap—0 to 7 inches, dark-brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

A2—7 to 11 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; moderate, medium, granular structure; very friable; neutral; clear, smooth boundary.

B21t—11 to 17 inches, dark-brown (7.5YR 4/4) sandy clay loam; weak, medium, subangular blocky structure; firm; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on faces of some peds; slightly acid; clear, smooth boundary.

B22t—17 to 31 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak, medium, subangular blocky structure; firm; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on faces of some peds; slightly acid; clear, wavy boundary.

B23t—31 to 41 inches, strong-brown (7.5YR 5/6) fine sandy loam; weak, coarse, subangular blocky structure; very friable; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on faces of some peds; strongly acid; gradual, wavy boundary.

B3—41 to 57 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, coarse, subangular blocky structure; friable; thin, discontinuous, dark-brown (7.5YR 4/4) clay films on faces of some peds; slightly acid; gradual, wavy boundary.

C—57 to 115 inches, dark yellowish-brown (10YR 4/4) very fine sand; single grained; very friable; slightly acid to neutral.

The solum ranges from 36 to 60 inches in thickness. The A horizon is 6 to 12 inches thick. In areas disturbed by plowing the Ap horizon is dark-brown (10YR 4/3) or yellowish-brown (10YR 5/4). In the dominant colors of the B2 horizon hue is 10YR, 7.5YR, or 5YR, value is 4 or 5, and chroma is 4 to 6. This horizon ranges from fine sandy loam to sandy clay in texture. In the dominant colors of the C horizon hue is 10YR, value is 5 or 6, and chroma is 3 to 8. The C horizon is loamy sand to sand.

Princeton soils are similar to Alford soils, but they are more sandy throughout than Alford soils.

Princeton fine sandy loam, 6 to 12 percent slopes, eroded (PrC2).—This soil is on ridgetops and foot slopes. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas where the soil has a surface layer of loamy fine sand. Also included were areas of gently sloping soils.

Runoff is medium on this soil, and erosion is the major concern in use and management. The moderately

coarse textured soil layers limit the available water capacity, and, because of this, lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is especially suited to alfalfa but is also suited to orchards. Peaches and apples are the main orchard crops. Capability unit IIIe-15; woodland group 1r2.

Princeton fine sandy loam, 12 to 18 percent slopes, eroded (PrD2).—This soil is on long, narrow breaks below ridgetops. It has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thinner.

Included with this soil in mapping were a few small areas that have a sandy loam surface layer and a few areas that are severely eroded.

Runoff is rapid on this soil, and runoff and erosion are the major concerns in use and management. The moderately coarse textured soil layers limit available water capacity. Because of this, lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to meadow and pasture crops and alfalfa. It is also suited to orchards, and apples and peaches are the main orchard crops. Capability unit IVe-15; woodland group 1r2.

Quarries

Quarries (Qu) is a land type that consists of limestone, gravel, and sand quarries. Limestone quarries make up most of this unit. They occur throughout the county, but the larger limestone quarries are north and south of Corydon and near Milltown. Gravel quarries are near Mauckport in the valley of the Ohio River. A sand quarry is northeast of Elizabeth. Included in mapping were the spoil areas around the quarries.

The hazard of erosion in spoil areas is the major concern of management. Most of this land is now barren, but in places weeds, shrubs, and wild grasses are growing. This land is suited to use as wildlife habitat and recreational areas. Capability unit VIIe-3; woodland group 4r16.

Sciotoville Series

The Sciotoville series consists of deep, nearly level and gently sloping, moderately well drained soils on terraces. These soils have a fragipan in the subsoil. They formed in mixed alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 8 inches thick. The subsurface layer is dark yellowish-brown silt loam about 4 inches thick. The subsoil is about 48 inches thick. The upper 5 inches is yellowish-brown friable silt loam. The next 6 inches is yellowish-brown and pale-brown firm silty clay loam that has light brownish-gray mottles. Below this is a 23-inch fragipan of pale-brown very firm clay loam that has yellowish-brown and light-gray mottles. The lower 14 inches of the subsoil is dark-brown firm clay loam that has light brownish-gray mottles. The underlying material is strong-brown and dark-brown stratified clay loam, silt loam, and loam. In addition it has less prominent layers of sand.

Sciotoville soils are moderate in content of organic matter and low in available phosphorus and potassium. Available water capacity is moderate, and permeability is very slow.

Representative profile of Sciotoville silt loam, 2 to 6 percent slopes, eroded, in a cultivated field, 2,000 feet south and 200 feet east of the northwest corner of sec. 8, T. 6 S., R. 5 E.:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam, moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

B1t—12 to 17 inches, yellowish-brown (10YR 5/6) silt loam; weak, medium, subangular blocky structure; friable; medium dark-brown (7.5YR 4/4) clay films on faces of most peds; medium acid; clear, smooth boundary.

B2t—17 to 23 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, subangular blocky structure; firm; thick dark-brown (7.5YR 4/4) clay films on faces of all peds; few black (10YR 2/1) concretions of manganese and iron oxide; medium acid; clear, smooth boundary.

Bx—23 to 46 inches, pale-brown (10YR 6/3) clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/2) mottles; strong, very coarse, prismatic structure, massive inside peds; very firm; strongly developed fragipan; many black (10YR 2/1) concretions of manganese and iron oxide; strongly acid; clear, smooth boundary.

B3—46 to 60 inches, dark-brown (7.5YR 4/4) clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; strong, coarse, prismatic structure, massive inside peds; firm; thin reddish-brown (5YR 4/4) clay films on faces of some peds; common black (10YR 2/1) concretions of manganese and iron oxide; strongly acid; clear, smooth boundary.

C—60 to 96 inches, strong-brown (7.5YR 5/6) and dark-brown (7.5YR 4/4) stratified clay loam, silt loam, loam, and less prominent layers of sand; massive; friable; strongly acid.

The solum ranges from 50 to 80 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches.

The A horizon is 6 to 14 inches thick. In areas disturbed by plowing, the Ap horizon is dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4). In the dominant colors of the B2t horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 2 to 6. The B2t horizon ranges from heavy silt loam to clay loam in texture.

Sciotoville soils are similar to Weinbach soils, but they have a browner subsoil than Weinbach soils.

Sciotoville silt loam, 0 to 2 percent slopes (ScA).—This soil is on large terraces along the Ohio River. It has a profile similar to that described as representative for the series, except the surface layer is about 3 inches thicker.

Included with this soil in mapping were a few small areas that have a loam surface layer.

Runoff is slow on this soil, and wetness early in spring is a limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to

alfalfa, because the fragipan restricts root penetration. Capability unit IIw–5; woodland group 3d9.

Sciotoville silt loam, 2 to 6 percent slopes, eroded (ScB2).—This soil is in areas along drainageways and in long, narrow areas adjacent to large areas of nearly level soils. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of severely eroded and slightly eroded soils and areas that have a loam surface layer.

Runoff is medium on this soil, and erosion is the major concern in use and management. Wetness early in spring is a limitation. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIe–7; woodland group 3d9.

Tilsit Series

The Tilsit series consists of deep, gently sloping, moderately well drained soils on uplands. These soils have a fragipan in the lower part of the subsoil. They formed in 20 to 40 inches of loess and underlying material weathered from sandstone, siltstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark yellowish-brown silt loam about 8 inches thick. The subsoil is about 38 inches thick. The upper 17 inches is yellowish-brown friable silt loam that has light brownish-gray mottles. The lower 21 inches is a fragipan of yellowish-brown and light brownish-gray very firm light silty clay loam and silt loam that has light brownish-gray and strong-brown mottles. The underlying material is brownish-yellow silty clay loam about 20 inches thick. The depth to interbedded shale and sandstone bedrock is about 66 inches.

Tilsit soils are moderate in content of organic matter and low in natural fertility. Available water capacity is moderate and permeability is very slow. Runoff is medium.

Representative profile of Tilsit silt loam, 2 to 6 percent slopes, eroded, in a meadow, 700 feet west and 1,400 feet north of the southeast corner of sec. 12, T. 2 S., R. 2 E.:

Ap—0 to 8 inches, dark yellowish-brown (10YR 3/4) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1—8 to 17 inches, yellowish-brown (10YR 5/6) silt loam; weak, medium, subangular blocky structure; friable; slightly acid; clear, smooth boundary.

B2t—17 to 25 inches, yellowish-brown (10YR 5/6) heavy silt loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles below a depth of 20 inches; moderate, medium, subangular blocky structure; friable; thin dark yellowish-brown (10YR 4/4) clay films on faces of some peds; very strongly acid; clear, smooth boundary.

Bx1—25 to 30 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; strong, very coarse, prismatic structure; very firm; very strongly acid; clear, smooth boundary.

I&IIBx2—30 to 46 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; strong, very coarse, prismatic structure parting to moderate, very thick, platy; very firm; extremely acid; clear, smooth boundary.

IIC—46 to 66 inches, brownish-yellow (10YR 6/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; massive; firm; extremely acid; abrupt, smooth boundary.

IIR—66 inches, interbedded shale and sandstone.

The solum ranges from 40 to 60 inches in thickness. Depth to interbedded shale and sandstone bedrock ranges from 48 to 72 inches. Thickness of the loess ranges from 20 to 40 inches. Depth to the fragipan ranges from 18 to 30 inches. The fragipan formed in loess or loess and material weathered from sandstone, siltstone, and shale.

In wooded areas the A1 horizon is 1 to 3 inches thick and ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The A2 horizon is 4 to 10 inches thick and ranges from dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4). In the dominant colors of the B2t horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 3 to 6. Texture of the B2t horizon is heavy silt loam or silty clay loam. The Bx horizon is 18 to 36 inches thick. In the dominant colors of the Bx horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 2 to 8. In the dominant colors of the IIC horizon hue is 10YR, value is 4 to 6, and chroma is 2 to 6. This horizon ranges from loam to silty clay loam in texture.

Tilsit soils are similar to Johnsburg and Zanesville soils, but they have browner horizons than Johnsburg soils and grayer horizons than Zanesville soils above the fragipan.

Tilsit silt loam, 2 to 6 percent slopes, eroded (TlB2).—This soil is on ridgetops. Included in mapping were a few small areas of slightly eroded and severely eroded soils and a few areas of well-drained soils.

Erosion is the major concern in use and management of this soil. Wetness early in spring is a limitation. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIe–7; woodland group 3d9.

Weikert Series

The Weikert series consists of shallow, very steep, well-drained, channery soils on uplands. They formed in material weathered from sandstone, siltstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown and dark grayish-brown channery silt loam about 8 inches thick. The subsoil, about 10 inches thick, is yellowish-brown friable channery heavy silt loam and 35 to 50 percent sandstone rock fragments. The depth to the interbedded hard sandstone and shale is about 18 inches.

Weikert soils are moderate in content of organic matter and low in available natural fertility. Available water capacity is very low, and permeability is moderately rapid. Runoff is very rapid.

Representative profile of Weikert channery silt loam in an area of Weikert-Berks channery silt loams, 35 to 60 percent slopes, in a wooded area, 2,200 feet east and 1,900 feet north of the southwest corner of sec. 3, T. 4 S., R. 2 E.:

O1—½ to ¼ inch, undecomposed leaf litter.

O2—¼ inch to 0, decomposed leaf litter.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) channery silt loam; moderate, medium, granular structure; friable; very strongly acid; clear, smooth boundary.
A2—3 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; moderate, medium, granular structure; friable; very strongly acid; gradual, smooth boundary.
B—8 to 18 inches, yellowish-brown (10YR 5/1) channery heavy silt loam; weak, medium, subangular blocky structure; friable; 35 to 50 percent sandstone fragments; very strongly acid; gradual, smooth boundary.
R—18 inches, hard sandstone and shale.

The solum is 8 to 20 inches thick, and thickness commonly is the same as the depth to sandstone and shale. Fine-grained sandstone and shale and thin, flat siltstone fragments range from 20 to 50 percent in the A horizon and from 30 to 65 percent in the B horizon.

The A1 horizon is 1 to 4 inches thick and ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The A2 horizon is 3 to 8 inches thick and ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). In the dominant colors of the B horizon hue is 10YR, value is 4 to 6, and chroma is 3 to 6.

Weikert soils are similar to Berks soils, but they are shallower and have a thinner B horizon than Berks soils.

Weikert-Berks channery silt loams, 35 to 60 percent slopes (WbF).—The soils in this complex are mostly in areas that are 40 to 100 acres in size but in places are in larger areas. Runoff is very rapid.

About 60 percent of this complex is Weikert channery silt loam, and 30 percent is Berks channery silt loam. The remaining 10 percent is other soils. The Weikert soil has the profile described as representative of the series. It has a thinner subsoil and is shallower to bedrock than the Berks soil.

Included with this complex in mapping were small areas of Corydon stony silt loam on lower side slopes in the western part of the county and on upper side slopes in the southeastern part of the county. Also included were areas where slope is less than 35 percent, small areas where a strongly acid soil is less than a foot deep over clayey shale, and small narrow areas of deep stony and channery soils that formed in colluvium at the base of slopes. Areas where sandstone, shale, or limestone crops out are indicated on the map by the symbol for rock outcrops.

Runoff and the hazard of erosion are the main limitations to use and management of soils in this complex. Shallow or moderate depth of soil, slope, and channery fragments and stones are other limitations. These soils are suited to trees and grass, and they can be used as wildlife habitat. Capability unit VIIe-2; woodland group 5r14.

Weinbach Series

The Weinbach series consists of deep, nearly level, somewhat poorly drained soils on terraces. These soils have a fragipan in the subsoil. They formed in mixed alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is brown silt loam about 14 inches thick. The subsoil is about 45 inches thick. The upper 9 inches is light brownish-gray friable silt loam that has brown and yellowish-brown mottles. The next 16 inches is a fragipan of light brownish-gray very firm silty clay loam that has strong-brown mottles, and the lower 20 inches is dark-brown firm silty clay loam that has light brownish-gray mottles. The underlying material is dark-brown sandy clay loam.

Weinbach soils are low in content of organic matter and low in available phosphorus and potassium. They have a seasonal high water table. Available water capacity is moderate, and permeability is very slow. Runoff is slow.

Representative profile of Weinbach silt loam in a cultivated field, 600 feet west and 2,200 feet south of the northeast corner of sec. 7, T. 6 S., R. 5 E.:

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.
A2—8 to 14 inches, brown (10YR 5/3) silt loam; many, medium, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.
B1—14 to 23 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, brown (10YR 5/3) and yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; thin dark-brown (7.5YR 4/4) clay films on faces of some peds; strongly acid; clear, smooth boundary.
Bx—23 to 39 inches, light brownish-gray (10YR 6/2) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; strong, very coarse, prismatic structure, massive inside peds; very firm; thin dark-brown (7.5YR 4/4) and light-gray (10YR 7/1) clay films on faces of some peds; few black (10YR 2/1) concretions of manganese and iron oxide; very strongly acid; clear, smooth boundary.
B2t—39 to 59 inches, dark-brown (7.5YR 4/4) silty clay loam; few, medium, distinct, light brownish-gray (10YR 6/2) mottles; strong, coarse, prismatic structure; firm; medium dark yellowish-brown (10YR 3/4) clay films on faces of most peds; very strongly acid; gradual, wavy boundary.
C—59 to 92 inches, dark-brown (7.5YR 4/4) sandy clay loam; common, medium, faint, pale-brown (10YR 6/3) and light brownish-gray (10YR 6/2) mottles; massive; friable; very strongly acid.

The solum ranges from 42 to 60 inches in thickness. Depth to the fragipan ranges from 18 to 30 inches.

The A horizon is 8 to 16 inches thick and is brown (10YR 5/3), grayish brown (10YR 5/2), or dark grayish brown (10YR 4/2). In the dominant colors of the B horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 2 to 6. This horizon ranges from silt loam to clay loam. The Bx horizon is 12 to 18 inches thick. In the dominant colors of the C horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 2 to 6. The C horizon ranges from silty clay loam to sandy clay loam in texture and contains less prominent layers of sand, silt, or gravel.

Weinbach soils are similar to Bartle soils, but they are finer textured. Unlike Bartle soils, the Weinbach soils formed in micaceous alluvium.

Weinbach silt loam (0 to 2 percent slopes) (Wc).—This soil is on terraces along the Ohio River. Included in mapping were small areas of soils that have a loam surface layer and areas of gently sloping eroded soils. Also included were areas of poorly drained soils that are grayer than this soil.

Wetness is the major limitation to use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is also a limitation if rainfall is below normal or is poorly distributed. If a suitable drainage system is established and maintained, this soil is suited to corn, soybeans, and small grain. It is also suited to meadow and pasture crops. It is not suited to alfalfa, because

the fragipan restricts root penetration. Capability unit IIw-3; woodland group 3w5.

Wellston Series

The Wellston series consists of moderately deep and deep, moderately sloping and strongly sloping, well-drained soils on uplands. They formed in 20 to 40 inches of loess and underlying material weathered from sandstone, siltstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark yellowish-brown silt loam about 9 inches thick. The subsoil is about 31 inches thick. The upper 6 inches is yellowish-brown friable silt loam. The next 15 inches is strong-brown firm silty clay loam, and the lower 10 inches is strong-brown friable silt loam that contains enough sand to give it a gritty feel. The depth to hard sandstone is about 40 inches.

Wellston soils are moderate in content of organic matter and low in natural fertility. Available water capacity is moderate or high, and permeability is moderate.

Representative profile of Wellston silt loam, 12 to 18 percent slopes, eroded, in a pasture, 1,300 feet east and 1,500 feet north of the southwest corner of sec. 32, T. 3 S., R. 3 E.:

Ap—0 to 9 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—9 to 15 inches, yellowish-brown (10YR 5/6) silt loam; weak, medium, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B2t—15 to 30 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; thin yellowish-red (5YR 5/8) clay films on faces of some peds; strongly acid; clear, wavy boundary.

IIB3—30 to 40 inches, strong-brown (7.5YR 5/8) silt loam; weak, medium, subangular blocky structure; friable; strongly acid; abrupt, wavy boundary.

IIR—40 inches, hard sandstone.

The solum is 36 to 60 inches thick, and thickness commonly is the same as the depth to sandstone bedrock. Thickness of the loess ranges from 20 to 40 inches.

The A horizon is 8 to 12 inches thick. The Ap horizon in areas disturbed by plowing is dark yellowish brown (10YR 4/4) or brown (10YR 5/3). In severely eroded areas this horizon commonly is yellowish brown (10YR 5/6). The A1 horizon in wooded areas is 1 to 3 inches thick and ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The A2 horizon ranges from brown (10YR 5/3) to yellowish brown (10YR 5/4). In the dominant colors of the B2t horizon hue is 10YR, 7.5YR, or 5YR, value is 4 to 6, and chroma is 4 to 8. The B2t horizon is silty clay loam or clay loam. The IIB3 horizon commonly contains enough sand to give it a gritty feel. In some areas a IIC horizon of yellowish-brown (10YR 5/6) channery silt loam is present.

Wellston soils are similar to Alford and Gilpin soils, but they are shallower to bedrock than Alford soils, and they have a thicker B horizon and solum than Gilpin soils.

Wellston silt loam, 6 to 12 percent slopes, eroded (WeC2).—This soil is in areas along the edges of ridgetops. It has a profile similar to that described as representative for the series, except the surface layer is about 2 inches thicker.

Included with this soil in mapping were a few small areas of slightly eroded soils. Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to meadow and pasture crops, corn, soybeans, and small grain. Capability unit IIIe-3; woodland group 3o10.

Wellston silt loam, 6 to 12 percent slopes, severely eroded (WeC3).—This soil is in areas along the edges of ridgetops. It has a profile similar to that described as representative for the series, except the surface layer is about 4 inches thinner.

Included with this soil in mapping were a few small areas of Wellston silt loam, 6 to 12 percent slopes, eroded, and a few small areas of a similar Wellston soil. Also included were areas that have small gullies.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to grass and trees and can be used as wildlife habitat. Capability unit IVe-3; woodland group 3o10.

Wellston silt loam, 12 to 18 percent slopes, eroded (WeD2).—This soil is on short breaks at the heads of draws and on sides of ridges. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas where the soil has slopes of more than 18 percent.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to grass and trees and can be used as wildlife habitat. Capability unit IVe-3; woodland group 3o10.

Wellston silt loam, 12 to 18 percent slopes, severely eroded (WeD3).—This soil is on short breaks at the heads of draws and on long sides of ridges. It has a profile similar to that described as representative for the series, except the surface layer is yellowish brown and about 4 inches thinner.

Included with this soil in mapping were areas that have many deep gullies in which sandstone or shale bedrock is exposed on the bottom.

Runoff is very rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to grass and trees and can be used as wildlife habitat. Capability unit VIe-1; woodland group 3o10.

Wheeling Series

The Wheeling series consists of deep, nearly level to moderately steep, well-drained soils on terraces. They formed in mixed alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown silt loam about 8 inches thick. The subsoil is about 59 inches thick. The upper 5 inches is dark yellowish-brown friable silt loam. The next 35 inches is strong-brown firm clay loam, and the lower 19 inches is strong-brown friable sandy clay loam. The underlying material is yellowish-brown and dark yellowish-brown loamy sand.

Wheeling soils are moderate in content of organic matter, low in available phosphorus, and medium in available potassium. Available water capacity is high, and permeability is moderate.

Representative profile of Wheeling silt loam, 2 to 6 percent slopes, eroded, in a meadow, 2,200 feet east and 200 feet north of the southwest corner of sec. 23, T. 6 S., R. 4 E.:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

B1t—8 to 13 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; thin dark-brown (10YR 3/3) clay films on faces of some peds; slightly acid; clear, smooth boundary.

B21t—13 to 28 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; firm; thick dark-brown (7.5YR 4/4) clay films on faces of most peds; strongly acid; gradual, smooth boundary.

B22t—28 to 48 inches, strong-brown (1.5YR 5/6) and dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; thin dark-brown (7.5YR 4/4) clay films on faces of some peds; few black (10YR 2/1) concretions of manganese and iron oxide; strongly acid; gradual, smooth boundary.

B3t—48 to 67 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak, coarse, subangular blocky structure; friable; thin dark-yellowish brown (10YR 4/4) clay films on faces of some peds; few black (10YR 2/1) concretions of manganese and iron oxide; very strongly acid; gradual, smooth boundary.

C—67 to 78 inches, yellowish-brown (10YR 5/6) and dark yellowish-brown (10YR 4/4) loamy sand; massive; friable; very strongly acid.

The solum ranges from 40 to 70 inches in thickness. The Ap horizon is 6 to 12 inches thick and is dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), or brown (10YR 5/3). This horizon is silt loam or loam. In the dominant colors of the B2 horizon hue is 10YR and 7.5YR, value is 4 or 5, and chroma is 3 to 6. The B2 horizon is clay loam or sandy clay loam. In the dominant colors of the C horizon hue is 10YR or 7.5YR, value is 4 to 6, and chroma is 2 to 6. The C horizon is loamy sand or fine sand and contains less prominent layers of silt loam and gravel.

Wheeling soils are similar to Elkinsville soils, but they are sandier than Elkinsville soils.

Wheeling silt loam, 0 to 2 percent slopes (WgA).—This soil is on large terraces. It has a profile similar to that described as representative for the series, except the surface layer is about 3 inches thicker.

Included with this soil in mapping were small areas of Sciotoville silt loam, 0 to 2 percent slopes, and a few small areas of soils that have a fine sandy loam or loam surface layer. Also included were a few areas of fine sandy loam underlain by loamy sand at a depth of about 40 inches.

Runoff is slow on this soil. There are no major hazards or limitations to use and management. This soil is suited to corn, soybeans, small grain, alfalfa, and meadow and pasture crops. Capability unit I-1; woodland group 1o1.

Wheeling silt loam, 2 to 6 percent slopes, eroded (WgB2).—This soil is in areas along drainageways and in long narrow areas along breaks of terraces. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of severely eroded or slightly eroded soils.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, soybeans, small grain, alfalfa, and meadow and pasture crops. Capability unit IIe-3; woodland group 1o1.

Wheeling loam, 6 to 12 percent slopes, eroded (WhC2).—This soil is in areas along drainageways and in long narrow areas along breaks of terraces. It has a profile similar to that described as representative for the series, except the surface layer is loam.

Included with this soil in mapping were a few small areas of slightly eroded soils.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to corn, soybeans, small grain, alfalfa, and meadow and pasture crops. Capability unit IIIe-3; woodland group 1o1.

Wheeling loam, 6 to 12 percent slopes, severely eroded (WhC3).—This soil is in short irregularly shaped areas along breaks of terraces and in areas at the heads of small drainageways. It has a profile similar to that described as representative for the series, except the surface layer is dark yellowish-brown loam and is about 3 inches thinner.

Included with this soil in mapping were a few small areas of gently sloping moderately eroded soils. Also included were areas that have a few small gullies. The latter are indicated on the map by the symbol for gully.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is suited to small grain, meadow and pasture crops, and alfalfa. Capability unit IVe-3; woodland group 1o1.

Wheeling loam, 12 to 25 percent slopes, eroded (WhE2).—This soil is on breaks of terraces along the Ohio River. It has a profile similar to that described as representative for the series, except the surface layer is loam and is about 3 inches thinner.

Included with this soil in mapping were small areas of slightly eroded and severely eroded Wheeling soils.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. This soil is not suited to cultivated crops. It is suited to grass and trees and can be used as wildlife habitat. Capability unit VIe-1; woodland group 1r2.

Zanesville Series

The Zanesville series consists of deep, moderately sloping and strongly sloping, well-drained soils on uplands. These soils have a very firm fragipan in the lower part of the subsoil. They formed in 20 to 40 inches of loess and underlying material weathered from sandstone, siltstone, and shale. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown silt loam about 3 inches thick. The subsurface layer is dark yellowish-brown silt loam about 5 inches thick. The subsoil is about 42 inches thick. The upper 3 inches is yellowish-brown friable silt loam, and the next 18 inches is strong-brown firm silty clay loam that has light brownish-gray mottles. The lower 21 inches is a fragipan of grayish-brown and yellowish-brown very firm silt loam that has yellowish-brown and light-gray mottles. The underlying material is brownish-yellow and dark yellowish-brown silt loam. The depth to sandstone bedrock is about 65 inches.

Zanesville soils are moderate or low in content of organic matter and low in natural fertility. Available water capacity is high, and permeability is very slow.

Representative profile of Zanesville silt loam, 6 to 12 percent slopes, eroded, in a wooded area, 900 feet east

and 1,700 feet south of the northwest corner of sec. 30, T. 1 S., R. 3 E.:

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—3 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium, granular structure; friable; strongly acid; clear, wavy boundary.

B1—8 to 11 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B21t—11 to 16 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; medium dark-brown (7.5YR 4/4) clay films on faces of most peds; strongly acid; clear, wavy boundary.

B22t—16 to 25 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; medium yellowish-brown (10YR 5/4) clay films on faces of most peds; strongly acid; clear, wavy boundary.

B23t—25 to 29 inches, strong-brown (7.5YR 5/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium and coarse, subangular blocky structure; firm; medium dark-brown (7.5YR 4/4) clay films on faces of most peds; very strongly acid; clear, irregular boundary.

I&IIBx1—29 to 44 inches, grayish-brown (10YR 5/2) silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; strong, very coarse, prismatic structure, massive inside peds; very firm; thin dark-brown (7.5YR 4/4) clay films on faces of some peds; very strongly acid; clear, wavy boundary.

IIBx2—44 to 50 inches, yellowish-brown (10YR 5/4) silt loam; many, fine, distinct, light-gray (10YR 7/2) mottles; strong, very coarse, prismatic structure, massive inside peds; very firm; few fine fragments of shale and sandstone; very strongly acid; clear, wavy boundary.

IIC—50 to 65 inches, brownish-yellow (10YR 6/6) and dark yellowish-brown (10YR 4/4) silt loam; massive; friable; few fine fragments of shale and sandstone; very strongly acid; abrupt, smooth boundary.

IIR—65 inches, sandstone bedrock.

The solum ranges from 36 to 60 inches in thickness. Depth of the profile to sandstone bedrock ranges from 48 to 72 inches. Thickness of the loess ranges from 20 to 40 inches. Depth to the fragipan ranges from 18 to 30 inches. Fine-grained sandstone and shale and thin, flat, siltstone fragments range from 5 to 20 percent in the IIC horizon.

The A horizon is 6 to 12 inches thick. In areas disturbed by plowing these soils have an Ap horizon of dark-brown (10YR 4/3) or dark yellowish-brown (10YR 4/4) silt loam. In areas of severely eroded soils the Ap horizon commonly is yellowish-brown (10YR 5/4) silty clay loam. In the dominant colors of the B2 horizon hue is 10YR and 7.5YR, value is 4 to 6, and chroma is 3 to 8. The B2 horizon is silty clay loam or silt loam. The Bx horizon is 18 to 36 inches thick. In the dominant colors of the Bx horizon hue is 10YR, value is 4 to 6, and chroma is 2 to 6. The Bx horizon ranges from loam to sandy clay loam in texture, and the IIC horizon ranges from silt loam to sandy loam.

Zanesville soils are similar to Johnsburg and Tilsit soils, but Zanesville soils have browner horizons above the fragipan than these soils.

Zanesville silt loam, 6 to 12 percent slopes, eroded (ZaC2).—This soil is on sides of ridges and on foot slopes. It has the profile described as representative for the series.

Included with this soil in mapping were a few small areas of severely eroded soils and areas of slightly eroded soils. Also included were wet seepage spots in small drains and drainageways.

Runoff is medium on this soil, and erosion and runoff are the major concerns in use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to corn, soybeans, small grain, and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IIIe-7; woodland group 3d9.

Zanesville silt loam, 6 to 12 percent slopes, severely eroded (ZaC3).—This soil is on sides of ridges and on foot slopes. It has a profile similar to that described as representative for the series, except the surface layer is yellowish brown and is about 4 inches thinner.

Included with this soil in mapping were a few small areas of slightly eroded soils and a few areas of strongly sloping severely eroded soils. Also included were wet seepage spots in small drains and drainageways and areas that have a few small gullies.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to small grain and meadow and pasture crops. Corn and soybeans can be grown occasionally, but, because of the extremely high erosion potential, erosion-control measures are needed. It is not suited to alfalfa, because the fragipan restricts root penetration. Capability unit IVe-7; woodland group 3d9.

Zanesville silt loam, 12 to 18 percent slopes, eroded (ZaD2).—This soil is in areas below ridgetops adjacent to steep and very steep soils on uplands. It has a profile similar to that described as representative for the series, except the surface layer is dark yellowish-brown and is about 3 inches thinner.

Included with this soil in mapping were a few small areas of slightly eroded soils and a few small areas of soils that are steep and very steep.

Runoff is rapid on this soil, and erosion and runoff are the major concerns in use and management. The fragipan limits the available water capacity, however, and lack of moisture in midsummer and late in summer is a limitation if rainfall is below normal or is poorly distributed. This soil is suited to small grain and meadow and pasture crops. It is not suited to alfalfa, because the fragipan restricts root penetration. Corn and soybeans can be grown occasionally, but, because of the extremely high erosion potential, erosion-control measures are needed. Capability unit IVe-7; woodland group 3d9.

Use and Management of the Soils

This section contains information about the use and management of the soils of Harrison County as cropland, woodland, and wildlife habitat and for engineering and recreational purposes. A section on predicted yields of important crops is also presented.

Use of the Soils for Crops

About one-half of the acreage of Harrison County is used for crops and permanent pasture. The main cultivated crops are corn, popcorn, soybeans, and wheat. The principal forage crops are clover, alfalfa, and grass. A small acreage is used for orchard and vegetable crops. Soil tests should be made to determine the need for lime and fertilizer.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or to other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None in Harrison County.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes. (None in Harrison County.)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States and not in Harrison County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-3 or IIIw-3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Harrison County are described, and suggestions for the use and management of the soils are given. Where lime and fertilizer are recommended, the application is assumed to be according to the results of soil tests.

CAPABILITY UNIT I-1

This unit consists of deep, nearly level soils of the Elkinsville and Wheeling series. These soils are well drained and medium textured.

The soils of this unit are moderate in content of organic matter and low in natural fertility. They have high available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed.

The soils are well suited to all crops commonly grown in the county. Corn, soybeans, wheat, alfalfa, and grass are the main crops. Little special management is needed, but maintenance of a desirable content of organic matter and level of fertility helps assure favorable crop production. Plowing crop residue and green manure crops into the soil helps to maintain a favorable content of organic matter. Crops respond well to applications of lime and fertilizer to the soil.

CAPABILITY UNIT I-2

This unit consists of deep, nearly level soils of the Haymond and Huntington series. These soils are well drained and medium textured.

The soils of this unit are moderate in content of organic matter and moderate or high in natural fertility. They have high available water capacity and moderate permeability. The plow layer is slightly acid or neutral. Flooding is a hazard from December to June.

The soils are well suited to most crops commonly grown in the county. Corn, soybeans, clover, and grass are the main crops. Alfalfa and fall-planted small grain crops are subject to severe damage during periods of prolonged flooding.

The main concern of management is maintenance of a desirable content of organic matter and level of fertility. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIe-3

This unit consists of deep, gently sloping soils of the Alford, Baxter, Crider, Elkinsville, and Wheeling series. These soils are well drained and medium textured.

The soils of this unit are moderately eroded. They are low in content of organic matter and low in natural fertility. They have high available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed. Erosion is a hazard.

These soils are suited to all crops commonly grown in the county. Corn, soybeans, wheat, alfalfa, and grass are the main crops. Alford and Crider soils are also suited to orchards.

The main concerns of management are controlling erosion and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour cultivation, and diversion terraces help to control erosion (fig. 16). Plowing crop residue and green-manure crops into the soils helps to maintain the content of organic matter and improve fertility. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

***Figure 16.*—Terraced field of corn and a concrete-block outlet, capability unit IIe-3 soils.**

CAPABILITY UNIT IIe-7

This unit consists of deep, gently sloping soils of the Bedford, Pekin, Sciotoville, and Tilsit series. These soils are moderately well drained and medium textured.

The soils of this unit are moderately eroded. They are moderate in content of organic matter and low in natural fertility. They have moderate available water capacity and very slow permeability. A very firm and brittle fragipan in the subsoil restricts the penetration of roots and water. The plow layer is strongly acid in areas that are not limed. Erosion is a hazard. Wetness is a limitation that generally causes prolonged delays in spring farming operations. In years when rainfall is less than normal or is poorly distributed, these soils are somewhat droughty, and crops are occasionally subject to damage.

The soils are suited to most crops commonly grown in the county. Corn, soybeans, wheat, clover, and grass are the main crops. Alfalfa is not well suited because of the restriction to root penetration by the fragipan and wetness early in spring.

The main concerns of management are controlling erosion, reducing wetness, and maintaining the content of organic matter and level of fertility.

Keeping tillage to a minimum (fig. 17), contour cultivation, grassed waterways, and diversion terraces help to control erosion. Plowing crop residue and green-manure crops into the soils helps to maintain the content of organic matter and improve fertility. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIw-1

Montgomery silty clay loam is the only soil in this unit. It is deep, nearly level, very poorly drained, and moderately fine textured.

This soil is high in content of organic matter and medium or high in natural fertility. It has high available water capacity and very slow permeability. The plow layer is slightly acid or neutral. Wetness is a major limitation. Large clods that frequently are difficult to break up are likely to form if this soil is tilled when it is too wet or too dry.

This soil is suited to most crops commonly grown in the county if a suitable drainage system is established and maintained. Corn, soybeans, small grain, grass, and pasture plants are the main crops. This soil is not well suited to alfalfa because of prolonged excessive wetness and the potential for frost heave.

The main concerns of management are reducing wetness and maintaining good tilth. Keeping tillage to a minimum, plowing crop residue into the soil, and working the soil at favorable moisture content help to maintain good tilth. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIw-3

This unit consists of deep, nearly level soils of the Bartle and Weinbach series. These soils are somewhat poorly drained, and they are medium textured.

The soils of this unit are low or moderate in content of organic matter and low in natural fertility. They have moderate available water capacity and very slow permeability. A fragipan in the subsoil restricts the

Figure 17.—**Plow-planted corn, Bedford silt loam.**

penetration of roots and water. The plow layer is strongly acid in areas that are not limed. Wetness is a major limitation.

The soils are suited to most crops commonly grown in the county if a suitable drainage system is established and maintained. Corn, soybeans, small grain, grass, and pasture are the main crops. These soils are not well suited to alfalfa because of prolonged excessive wetness and the fragipan that restricts root penetration.

The main concerns of management are reducing wetness and maintaining the content of organic matter and level of fertility.

Plowing crop residue and green-manure crops into the soils helps to maintain the content of organic matter and level of fertility.

CAPABILITY UNIT IIw-5

This unit consists of deep, nearly level soils of the Bedford, Pekin, and Sciotoville series. These soils are moderately well drained and medium textured.

The soils of this unit are moderate in content of organic matter and low in natural fertility. They have moderate available water capacity and very slow permeability. A very firm and brittle fragipan in the subsoil restricts root and water penetration. The plow layer is strongly acid in areas that are not limed. Wetness early in spring and the very slowly permeable fragipan limit use. In years when rainfall is less than normal or is poorly distributed, the soils are somewhat droughty, and crops occasionally are subject to damage.

The soils are suited to most crops commonly grown in the county. Corn, soybeans, wheat, clover, and grass are the main crops. Alfalfa is not well suited because of the restriction to root penetration by the fragipan and wetness early in spring.

The main concerns of management are maintaining the content of organic matter and level of fertility and reducing wetness. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable

content of organic matter and a favorable level of fertility. Providing a suitable drainage system allows planting crops earlier in spring and contributes greatly to higher production. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIw-7

Newark silt loam is the only soil in this unit. It is deep, nearly level, somewhat poorly drained, and medium textured.

This soil is low in content of organic matter and low to medium in natural fertility. It has high available water capacity and moderate permeability. The plow layer is slightly acid or neutral. Wetness is a limitation, and flooding is a hazard. This soil is subject to sedimentation when flooded.

This soil is well suited to most crops commonly grown in the county if a suitable drainage system is established and maintained. Corn, soybeans, grass, and pasture are the main crops. Small grain and alfalfa are subject to severe damage during periods of prolonged flooding.

The main concerns of management are reducing wetness, controlling flooding, and maintaining a desirable level of organic matter. Plowing crop residue and green-manure crops into the soil helps to improve tilth and maintain a favorable content of organic matter. Delayed planting of crops in spring after the normal period for flood hazard helps to avoid damage or complete losses of crops from flooding. Providing a suitable drainage system allows planting crops earlier in spring and contributes greatly to higher production. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIIe-1

This unit consists of deep, gently sloping and moderately sloping soils of the Baxter series. The soils are well drained and medium textured or moderately fine textured.

The soils of this unit are low or moderate in content of organic matter and low in natural fertility. They have high available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed. The gently sloping soils in this unit are severely eroded, and the moderately sloping soils are moderately eroded. These soils have a moderately fine textured or clayey subsoil. Erosion and runoff are hazards.

The soils are suited to all crops commonly grown in the county. Corn, soybeans, small grain, alfalfa, and grass are the main crops.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, diversion terraces, and use of winter cover crops help to control erosion and runoff. Grassed waterways also help to control erosion. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter and improve fertility and tilth. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIIe-3

This unit consists of deep and moderately deep, gently sloping and moderately sloping soils of the Alford, Crider, Elkinsville, Hagerstown, Wellston, and Wheeling series. These soils are well drained and medium textured.

The soils of this unit are moderate in content of organic matter and low in natural fertility. They have high available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed. The gently sloping soils in this unit are severely eroded, and the moderately sloping soils are moderately eroded. Moderately deep areas of Wellston silt loam have moderate available water capacity. Erosion and runoff are hazards.

The soils are suited to all crops commonly grown in the county. Corn, soybeans, small grain, alfalfa, and grass are the main crops. Alford silt loam is suited to orchards.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, diversion terraces, and use of winter cover crops help to control erosion and runoff. Grassed waterways also help to control erosion (fig. 18). Plowing crop residue and green-manure crops into the soils helps to maintain a favorable content of organic matter and level of fertility and tilth. Applications of lime to the soil help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer.

CAPABILITY UNIT IIIe-7

This unit consists of deep, gently sloping and moderately sloping Bedford and Zanesville soils that have fragipans. These soils are moderately well drained and well drained, and they are medium textured.

The soils in this unit are low or moderate in content of organic matter and low in natural fertility. They have moderate available water capacity and very slow permeability. The plow layer is strongly acid in areas

Figure 18.—Grassed waterway on an Elkinsville soil.

that are not limed. The gently sloping soils in this unit are severely eroded, and the moderately sloping soils are moderately eroded. Erosion and runoff are hazards. These soils become somewhat droughty if rainfall is less than normal or is poorly distributed.

The soils are suited to corn, soybeans, small grain, grass, and pasture. Alfalfa is not well suited because of the restriction to root penetration by the fragipan.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, diversion terraces, and use of winter cover crops help to control erosion and runoff. Grassed waterways also help to control erosion. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter and favorable levels of fertility and tilth. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIIe-11

Markland silt loam, 2 to 6 percent slopes, eroded, is the only soil in this unit. It is deep, well drained, and medium textured.

This soil is moderate in content of organic matter and low in natural fertility. It has high available water capacity and slow permeability. The plow layer is medium acid in areas that are not limed. This soil has a moderately fine textured or clayey subsoil. Erosion and runoff are hazards.

This soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, alfalfa, and grass are the main crops.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, diversion terraces, and use of winter cover crops help to control erosion and runoff. Grassed waterways also help to control erosion and runoff. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter and favorable levels of fertility and tilth. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIIe-15

Princeton fine sandy loam, 6 to 12 percent slopes, eroded, is the only soil in this unit. It is deep, well drained, and moderately coarse textured.

This soil is moderate in content of organic matter and low to medium in natural fertility. It has moderate available water capacity and permeability. The plow layer is strongly acid in areas that are not limed. Erosion and runoff are hazards. In years that rainfall is less than normal or is poorly distributed, this soil is droughty.

This soil is suited to all crops commonly grown in the county. Corn, soybeans, small grain, alfalfa, and grass are the main crops. It is also suited to orchards.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, diversion terraces, and use of winter cover crops help to control erosion and runoff. Grassed waterways also help to control erosion. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter and level of fertility and tilth. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIIw-3

Johnsburg silt loam is the only soil in this unit. It is deep, nearly level, somewhat poorly drained, and medium textured.

This soil is low in content of organic matter and low in natural fertility. It has moderate available water capacity and very slow permeability. A very firm and brittle fragipan in the subsoil restricts the penetration of roots and water. The plow layer is strongly acid in areas that are not limed. Wetness is the major limitation to use.

This soil is suited to most crops commonly grown in the county if a suitable drainage system is established and maintained. Corn, soybeans, small grain, clover, and grass are the main crops. Alfalfa is not well suited because of the restriction to root penetration by the fragipan.

The main concerns of management are reducing wetness and maintaining the content of organic matter and level of fertility. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter and level of fertility. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IIIw-6

McGary silt loam is the only soil in this unit. It is deep, nearly level, somewhat poorly drained, and medium textured.

This soil is low in content of organic matter and low to medium in natural fertility. It has high available water capacity and slow permeability. The plow layer is medium acid in areas that are not limed. Wetness is the major limitation to use.

This soil is suited to most crops commonly grown in the county if a suitable drainage system is established and maintained. Corn, soybeans, small grain, clover, and grass are the main crops. Alfalfa is not well suited because of the slowly permeable subsoil and excessive wetness in winter and early in spring.

The main concerns of management are reducing wetness and maintaining the content of organic matter and level of fertility. Plowing crop residue and green-manure crops into the soil helps to maintain a favorable content of organic matter and level of fertility. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IVe-1

This unit consists of deep, moderately sloping and strongly sloping soils of the Baxter series. These soils are well drained and medium textured and moderately fine textured.

The soils in this unit are low or moderate in content of organic matter and low in natural fertility. They have high available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed. Some of the soils in this unit are severely eroded and have a moderately fine textured surface layer in which undesirable clods easily form if the soils are cultivated when they are too wet or too dry.

The soils are suited to small grain, alfalfa, and grass. Corn and soybeans can be grown occasionally, but the hazard of further erosion is severe.

Controlling further erosion and controlling runoff are major concerns in use and management. Maintaining the content of organic matter and level of fertility are other important concerns. Maintenance of good tilth is needed in areas of severely eroded soil. Plowing crop residue and green-manure crops into the soils helps to maintain a favorable content of organic matter and level of fertility and also helps to improve tilth of the severely eroded soil. Keeping tillage at a minimum, contour farming, and stripcropping help to control further erosion and runoff. Grassed waterways and diversion terraces on the moderately sloping soils also help to control further erosion and runoff. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IVe–3

This unit consists of deep, moderately sloping and strongly sloping soils of the Crider, Elkinsville, Hagerstown, Wellston, and Wheeling series. These soils are well drained and medium textured and moderately fine textured.

The soils in this unit are low or moderate in content of organic matter and low in natural fertility. They have high available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed. Most soils in this unit are severely eroded. Hagerstown silt loam and Wellston silt loam on strong slopes are eroded. Severely eroded Hagerstown soils have a moderately fine textured surface layer in which undesirable clods easily form if the soils are cultivated when too wet or too dry. Some Wellston soils are moderately deep and have moderate available water capacity. Areas of moderately deep Wellston soils are somewhat droughty in midsummer or late in summer in years when rainfall is less than normal or is poorly distributed.

The soils are suited to small grain, alfalfa, and grass (fig. 19). Corn and soybeans can be grown occasionally, but the erosion hazard is severe. Crider soils are also suited to orchards.

The hazards of erosion and runoff are severe on soils of this unit. The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Maintenance of good tilth is needed on the severely eroded Hagerstown soils. Plowing crop residue and green-manure crops into the soils helps to maintain a favorable content of organic matter and level of fertility. This also helps to improve the tilth on moderately fine textured Crider and Hagerstown soils. Keeping tillage to a minimum, contour farming, stripcropping, grassed waterways, and diversion terraces help to control erosion and runoff. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

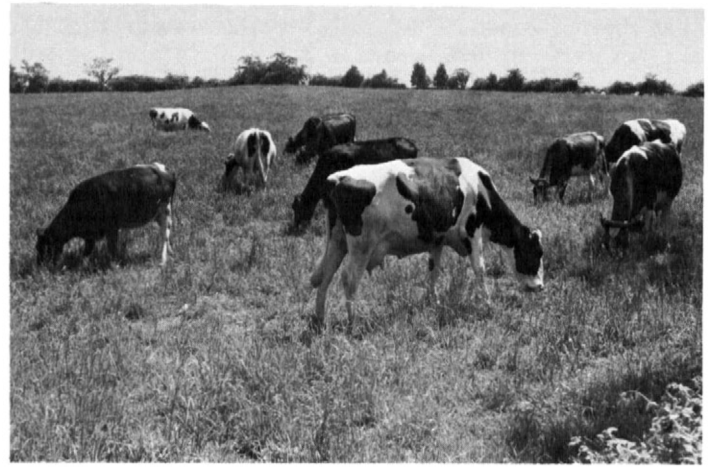

Figure 19.—**Dairy cows in grass pasture on Crider soils.**

CAPABILITY UNIT IVe–7

This unit consists of deep, moderately sloping and strongly sloping soils of the Zanesville series that have fragipans. These soils are well drained and medium textured.

The soils in this unit are low in content of organic matter and low in natural fertility. They have moderate available water capacity and very slow permeability. The plow layer is strongly acid in areas that are not limed. The moderately sloping soils in this unit are severely eroded, and the strongly sloping soils are moderately eroded. Erosion and runoff are hazards. These soils are somewhat droughty in years that have less rainfall than normal or in years in which the rainfall is poorly distributed.

The soils are suited to small grain, clover, and grass. Corn and soybeans can be grown occasionally, but the erosion hazard is severe. Alfalfa is not well suited, because of the restriction of root penetration by the fragipan.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Plowing crop residue and green-manure crops into the soils helps to maintain a favorable content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, and stripcropping help to control erosion and runoff. Grassed waterways and diversion terraces on moderately sloping soils also help to control erosion and runoff. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IVe–8

Baxter cherty silt loam, 6 to 12 percent slopes, eroded, is the only soil in this unit. It is deep, well drained, and medium textured.

This soil is low in content of organic matter and low in natural fertility. It has high available water capacity and moderate permeability. The plow layer is strongly

acid in areas that are not limed. This soil is moderately eroded and has a cherty silt loam surface layer that interferes with tillage operations.

This soil is suited to small grain, alfalfa, and grass. Corn and soybeans can be grown occasionally, but the erosion potential is extremely high.

Erosion and runoff are major concerns of use and management. Other important concerns are maintaining the content of organic matter and maintaining the level of fertility. Plowing crop residue and green-manure crops into the soils helps to maintain a favorable content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, and diversion terraces help to control erosion and runoff. Grassed waterways also help to control erosion. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer to the soil.

CAPABILITY UNIT IVe-15

Princeton fine sandy loam, 12 to 18 percent slopes, eroded, is the only soil in this unit. It is deep, well drained, and moderately coarse textured.

This soil is moderate in content of organic matter and low in fertility. It has moderate available water capacity and moderate permeability. The plow layer is strongly acid in areas that are not limed. Erosion and runoff are hazards. In years when rainfall is less than normal or is poorly distributed, this soil is droughty.

This soil is suited to small grain, alfalfa, and grass. Corn and soybeans can be grown occasionally, but the hazard of erosion is severe. This soil is also suited to orchards.

The main concerns of management are controlling erosion and runoff and maintaining the content of organic matter and level of fertility. Keeping tillage to a minimum, contour farming, stripcropping, and use of winter cover crops help to control erosion. Grassed waterways also help to control erosion. Plowing crop residue and green-manure crops into the soils helps to maintain a favorable content of organic matter and level of fertility and tilth. Applications of lime help to maintain a favorable reaction in the plow layer. Crops respond well to applications of fertilizer.

CAPABILITY UNIT VIe-1

This unit consists of moderately deep and deep, sloping to very steep soils of the Alford, Baxter, Gilpin, Hagerstown, Markland, Wellston, and Wheeling series. These soils are well drained and medium textured and moderately fine textured.

The soils in this unit are low or moderate in content of organic matter and low or medium in natural fertility. They have moderate or high available water capacity and slow to moderate permeability. The surface layer is strongly acid in areas that are not limed, except for the neutral or slightly acid Markland soils. Soils in this unit are either severely eroded or moderately eroded.

The soils are suited to permanent grass pasture (fig. 20). Erosion and runoff are major concerns in use and management. Maintaining a permanent plant cover helps in their control. Contour farming and keeping tillage to a minimum when preparing seedbeds to establish permanent pasture also help to control erosion and runoff. Pasture crops, orchards, and orchard cover crops respond well to applications of lime and fertilizer to the soil.

Figure 20.—**Beef cattle in grass pasture on Baxter soils.**

CAPABILITY UNIT VIIe-1

This unit consists of deep and moderately deep, strongly sloping and moderately steep soils of the Baxter, Gilpin, and Markland series. These soils are well drained and medium textured and moderately fine textured. They have a clayey subsoil, except for the Gilpin soils, which have a loamy subsoil.

The soils in this unit are low in content of organic matter and low to medium in natural fertility. They have moderate to high available water capacity and permeability. Runoff is rapid to very rapid. Soils in this unit are severely eroded, except for some of the Baxter soils and the Markland soils.

The soils are not suited to cultivation. They are suited to selected hardwoods and evergreens. Well-established native grasses grow well in areas that have a limited canopy cover from trees. These areas are suitable for limited grazing.

Erosion and runoff are major concerns in use and management. Maintaining a permanent tree or grass cover helps to reduce these hazards. Areas that are used for grazing need to be protected from overgrazing to help control erosion and runoff.

CAPABILITY UNIT VIIe-2

This unit consists of shallow and moderately deep, moderately steep and very steep stony and channery soils of the Berks, Corydon, Gilpin, and Weikert series. These soils are well drained and medium textured.

The soils in this unit are moderate or high in content of organic matter and low to medium in natural fertility. They have low available water capacity and moderate or moderately rapid permeability. Runoff is rapid to very rapid.

The soils are not suited to cultivation. They are suited to selected hardwoods and evergreens. Well-established native grasses grow well in areas that have a limited

TABLE 2.—*Predicted yields per acre of principal crops*

[Absence of data indicates that the crop is either not grown or is not suited to the soil specified]

Soil	Corn	Soybeans	Wheat	Clover-grass hay	Alfalfa-grass hay
	Bu	*Bu*	*Bu*	*Tons*	*Tons*
Alford silt loam, 2 to 6 percent slopes	105	40	45	4. 0	5. 0
Alford silt loam, 6 to 12 percent slopes, eroded	100	35	40	3. 0	4. 0
Alford silt loam, 18 to 35 percent slopes, eroded			25	2. 5	3. 5
Bartle silt loam	100	35	40	3. 0	
Baxter silt loam, 2 to 6 percent slopes, eroded	100	40	45	3. 5	4. 0
Baxter silt loam, 6 to 12 percent slopes, eroded	95	35	40	3. 5	4. 0
Baxter silt loam, 12 to 18 percent slopes, eroded	85	30	35	3. 0	3. 5
Baxter cherty silt loam, 6 to 12 percent slopes, eroded	85	30	35	3. 0	3. 5
Baxter cherty silt loam, 12 to 18 percent slopes, eroded		23	23	2. 5	3. 0
Baxter cherty silt loam, 18 to 25 percent slopes, eroded			20	2. 0	2. 5
Baxter cherty silt loam, 25 to 35 percent slopes, eroded				1. 5	
Baxter silty clay loam, 2 to 6 percent slopes, severely eroded	90	35	40	3. 5	3. 5
Baxter silty clay loam, 6 to 12 percent slopes, severely eroded	80	30	35	3. 0	3. 5
Baxter cherty silty clay loam, 6 to 12 percent slopes, severely eroded			25	2. 5	3. 0
Baxter cherty silty clay loam, 12 to 18 percent slopes, severely eroded				2. 0	2. 5
Baxter cherty silty clay loam, 18 to 25 percent slopes, severely eroded				2. 0	2. 5
Bedford silt loam, 0 to 2 percent slopes	95	40	45	3. 0	
Bedford silt loam, 2 to 6 percent slopes, eroded	85	35	40	3. 0	
Bedford silt loam, 2 to 6 percent slopes, severely eroded	80	30	35	2. 5	
Corydon stony silt loam, 20 to 60 percent slopes					
Crider silt loam, 2 to 6 percent slopes, eroded	110	45	40	4. 0	5. 0
Crider silt loam, 6 to 12 percent slopes, eroded	90	35	35	3. 5	4. 5
Crider soils, 2 to 6 percent slopes, severely eroded	90	35	35	3. 5	4. 5
Crider soils, 6 to 12 percent slopes, severely eroded	80	30	30	3. 0	4. 0
Elkinsville silt loam, 0 to 2 percent slopes	115	45	45	4. 0	5. 0
Elkinsville silt loam, 2 to 6 percent slopes, eroded	110	45	40	4. 0	5. 0
Elkinsville silt loam, 6 to 12 percent slopes, eroded	90	35	35	3. 5	4. 5
Elkinsville silt loam, 6 to 12 percent slopes, severely eroded	75	30	30	3. 0	4. 0
Gilpin silt loam, 12 to 18 percent slopes, eroded			25	2. 5	
Gilpin silt loam, 12 to 20 percent slopes, severely eroded				2. 5	
Gilpin silt loam, 18 to 25 percent slopes, eroded			22	2. 3	
Gilpin-Berks complex, 18 to 30 percent slopes					
Gullied land					
Hagerstown silt loam, 6 to 12 percent slopes, eroded	95	35	40	3. 5	4. 5
Hagerstown silt loam, 12 to 18 percent slopes, eroded	85	30	35	3. 0	4. 0
Hagerstown silt loam, 18 to 25 percent slopes, eroded			23	2. 0	2. 5
Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	85	30	35	3. 0	4. 0
Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded			23	2. 0	2. 5
Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded			23	2. 0	2. 5
Haymond silt loam	120	45		3. 5	4. 5
Huntington silt loam	120	45		3. 5	4. 5
Johnsburg silt loam	95	35	40	3. 0	
Markland silt loam, 2 to 6 percent slopes, eroded	85	30	35	2. 5	3. 5
Markland silt loam, 8 to 18 percent slopes, eroded			23	2. 5	3. 0
Markland silt loam, 25 to 70 percent slopes				1. 5	2. 5
Markland silty clay loam, 8 to 18 percent slopes, severely eroded				2. 0	2. 5
McGary silt loam	85	35	35	2. 5	
Montgomery silty clay loam	100	35	35	2. 5	3. 5
Newark silt loam	105	35		2. 5	3. 5
Pekin silt loam, 0 to 2 percent slopes	95	40	45	3. 0	
Pekin silt loam, 2 to 6 percent slopes, eroded	90	35	40	3. 0	
Princeton fine sandy loam, 6 to 12 percent slopes, eroded	85	35	40	3. 0	4. 0
Princeton fine sandy loam, 12 to 18 percent slopes, eroded	80	30	35	2. 5	3. 5
Quarries					
Sciotoville silt loam, 0 to 2 percent slopes	110	40	45	3. 0	
Sciotoville silt loam, 2 to 6 percent slopes, eroded	100	35	40	3. 0	
Tilsit silt loam, 2 to 6 percent slopes, eroded	85	35	40	3. 0	
Weikert-Berks channery silt loams, 35 to 60 percent slopes					
Weinbach silt loam	100	35	40	3. 0	
Wellston silt loam, 6 to 12 percent slopes, eroded	80	30	35	3. 0	4. 0
Wellston silt loam, 6 to 12 percent slopes, severely eroded	75	25	30	2. 5	3. 5
Wellston silt loam, 12 to 18 percent slopes, eroded	70	22	25	2. 5	3. 0
Wellston silt loam, 12 to 18 percent slopes, severely eroded			20	2. 0	2. 5
Wheeling silt loam, 0 to 2 percent slopes	115	45	45	4. 0	5. 0
Wheeling silt loam, 2 to 6 percent slopes, eroded	110	45	40	4. 0	5. 0
Wheeling loam, 6 to 12 percent slopes, eroded	100	35	35	3. 5	4. 5
Wheeling loam, 6 to 12 percent slopes, severely eroded	95	30	30	3. 0	4. 0
Wheeling loam, 12 to 25 percent slopes, eroded				2. 0	2. 5
Zanesville silt loam, 6 to 12 percent slopes, eroded	80	25	30	2. 5	
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	70	20	30	2. 0	
Zanesville silt loam, 12 to 18 percent slopes, eroded	65	25	25	2. 0	

canopy cover from trees. These areas are suitable for limited grazing.

Erosion and runoff are major concerns in use and management. Maintaining a permanent tree or grass cover helps to reduce these hazards. Areas that are used for grazing need to be protected from overgrazing to help control erosion and runoff.

CAPABILITY UNIT VIIe-3

Only the land type Quarries is in this unit. Most of these are limestone quarries, but some gravel quarries are near Mauckport, and a sand quarry is northeast of Elizabeth. Areas of this land consist of exposed limestone, gravel, or sand, except for the spoil areas around the quarries.

Most of the areas are now barren, but in places shrubs, weeds, and native grasses are growing in the spoil areas. These areas are suited to trees, which help to stabilize the soil material and provide cover for wildlife.

CAPABILITY UNIT VIIe-4

Only the land type Gullied land is in this unit. It is extremely variable in slope, texture, drainage, and suitability for farming. It is on uplands throughout the county and on terraces in some small areas.

Gullied land consists of areas that are more than 20 percent moderately deep or deep gullies and of areas from which most of the solum has been removed by severe sheet erosion.

Runoff and erosion are major concerns in use and management. Most of this land is now barren, but in places shrubs, weeds, and wild grasses are growing. It is suited to grasses, trees, and shrubs, which help to stabilize the soil material, control runoff, and provide cover for wildlife. Many ridges between gullies are suited to pine trees.

Predicted yields

Predicted yields of the principal crops grown in Harrison County are shown in table 2. These yields are averages for a period of 5 to 10 years. They are based on farm records, on interviews with farmers and with members of the staff of the Purdue University Agricultural Experiment Station, and on direct observations by soil scientists and soil conservationists. Factors considered in making the predicted yields were the prevailing climate, the characteristics of the soils, and the influence of management on the soils.

These yield figures are not intended to apply directly to specific tracts of land for any particular year, because the soils vary somewhat from place to place, management practices differ from farm to farm, and weather conditions vary from year to year. Nevertheless, the predicted yields are useful in showing relative productivity of the soils.

The following are assumed to be part of a management system needed to obtain the yields given in table 2:

1. Using cropping systems that maintain tilth and organic-matter content.
2. Controlling erosion to the maximum extent feasible, so that the quality of the soil is maintained or improved rather than reduced.
3. Maintaining a high level of fertility by means of frequent soil tests and use of fertilizer in accordance with recommendations of the Purdue University Agricultural Experiment Station.
4. Liming the soils in accordance with the results of soil tests.
5. Using crop residue to the fullest extent practicable to protect and improve the soil.
6. Following minimum tillage practices where needed because of the soil hazards of compaction and erosion.
7. Planting crop varieties that are best adapted to the climate and the soil.
8. Controlling weeds, insects, and plant diseases by tillage and spraying as required.
9. Draining wet areas well enough so that wetness does not restrict yields of adapted crops.

Woodland [2]

Hardwood trees were the main plant cover in Harrison County when the original settlers arrived in the area. Many stories have been told regarding the hardwood trees found during the period of early homesteading. Undoubtedly Harrison County has produced some of the finest quality hardwoods found anywhere in the United States. Land clearing for other uses has progressed rather rapidly, and by 1969 the Conservation Needs Inventory reported a total of 131,490 acres of woodland in the county.

In some parts of the county clearing was performed with little regard for the soils or the steepness of slopes. This has resulted in severe erosion on the soils and later abandonment of fields because of reduced growth. In 1969 the Conservation Needs Inventory estimated that approximately 39,400 acres need to be reforested to control erosion and to establish a productive woodland crop (fig. 21).

[2] By JOHN O. HOLWAGER, woodland conservationist, Soil Conservation Service.

Figure 21.—Stand of red pine that was planted in severely eroded and moderately sloping Zanesville soils.

In addition to the privately owned acres of woodland in Harrison County, the State of Indiana owns and manages the 14,000 acres in the Harrison-Crawford State Forest. This area has served as a valuable example of properly managed timberlands to other owners of woodland in the southern part of Indiana. In addition to its value for producing woodland products, the State forest is rapidly gaining popularity as a wildlife habitat and recreation area.

The soils of Harrison County range widely in their suitability for trees. Some of the poorest soils for growing trees are in the county, but there are some soils that are capable of producing better timber than elsewhere in Indiana.

The most important factors that affect the productive capacity of the soil for growing trees are the ability of the soil to maintain optimum moisture and to allow the development of an adequate root system. Additional characteristics of soils and sites that are important for producing timber crops are the thickness of the surface layer, texture and consistency of the soil material, depth to mottling or depth to water table, content of rock or shale, and amount of natural supply of plant nutrients in the soil.

The wooded areas of the county can be separated into four hardwood types for management purposes. The four types are named for the predominate tree species, but they vary widely in the mixture of trees growing in association with the major species.

Upland oak is the dominant forest type in the county. It is in a large percent of the upland areas, on steep slopes, and in areas of better drained soils. It normally is made up of mixed white, black, red, scarlet, and chinquapin oaks, but growing in association with the oaks are hickory, ash, sugar maple, tulip-poplar, and redcedar.

Tulip-poplar generally grows on the lower parts of north and northeast facing slopes (cool aspects) and in the narrow valleys or coves. Tulip-poplar is one of the more valuable trees and is the species generally encouraged in cutting practices. Other species commonly growing in association with tulip-poplar are white oak, red oak, hickory, beech, ash, black walnut, sugar maple, and basswood.

TABLE 3.—*Suitability of the*

Group	Species	Site index [1]	Estimated yearly growth [2]	Species in natural stands		
				Most desirable	Acceptable	Least desirable
Group 1o1: AfB, AfC2, BcB2, BcC2, BcD2, BlB3, BlC3, CrB2, CrC2, CsB3, CsC3, ElA, ElB2, ElC2, ElC3, HaC2, HaD2, HgC3, HgD3, WgA, WgB2, WhC2, WhC3.	Upland oaks Tulip-poplar	85–95 90–105	300–375 335–450	Red oak, white oak, white ash, tulip-poplar, black walnut, sugar maple.	Black oak, sweetgum, red elm, beech, sassafras.	Hickory, blackgum, white elm, red maple.
Group 1o8: Hm, Hu	Tulip-poplar White pine	95–105 80–90	375–450 260–335	Cottonwood, sycamore, tulip-poplar, black walnut, white ash.	Hackberry, red maple, bur oak, swamp chestnut oak, sweetgum.	Boxelder, willow, silver maple, white elm, hickory.
Group 1r2: AfF2, HaE2, HgE3, PrC2, PrD2, WhE2.	Upland oaks Tulip-poplar	85–95 95–105	300–375 375–450	Red oak, tulip-poplar, white oak, white ash, black walnut, sugar maple.	Black oak, sweetgum, red elm.	Hickory, red maple, white elm, blackgum.
Group 2w11: Mo	Pin oak Upland oaks Sweetgum White pine	80–90 70–80 85–95 [3] 80–90	260–335 185–260 300–375 [3] 260–335	Pin oak, red maple, bur oak, white ash, sweetgum.	Sycamore, white oak, tulip-poplar, swamp white oak, river birch.	White elm boxelder, beech, hickory, blackgum.

See footnotes at end of table.

Pin oak is only on the soils that are poorly drained or that have a high water table. Species grown in association with pin oak are red maple, sweetgum, swamp white oak, ash, and hickory.

Sweetgum is on soils similar to those described for pin oak and generally is the dominant species used in regeneration of abandoned wet crop fields. Growing in association with sweetgum are red maple, river birch, ash, hickory, and sycamore.

Natural seeded stands of pine are nonexistent in Harrison County. Planted stands of pine have been established in a widely scattered pattern throughout most of the county. These plantings were established largely for erosion control and on sites not suitable for hardwoods because of past practices. Virginia, white, shortleaf, and red pine are the species of pine most commonly planted.

Woodland groups

To assist landowners in planning the use of their soils for woodland crops, the soils of this county have been placed in 14 woodland groups. Each woodland group is made up of soils that are capable of producing similar kinds of wood crops, that need similar management to produce these crops when the existing vegetation is similar, and that have about the same potential productivity.

Soils in Harrison County have been evaluated and rated on the basis of their performance when used for production of wood crops or establishment of new plantings. Their suitability as woodland is presented in table 3. The "Guide to Mapping Units" lists each mapping unit and its proper woodland group.

An important factor used in grouping the mapping units was the potential soil productivity rating, which is expressed as site index for woodland crops of upland oak, tulip-poplar, pin oak, sweetgum, shortleaf pine, white pine, and Virginia pine. The site index indicates the total height attained by the dominant trees in a stand at age 50. For example, a site index of 80 for upland oak means that the dominant oak trees on a given site will average 80 feet in height at the age of 50 years.

Published site index curves based on unmanaged stands were used in calculating the average site index range for each woodland group. The necessary field data on woodland crops was supplied by numerous field plots and detailed soil site descriptions.

soils as woodland

Species suitable for planting	Seedling mortality	Plant competition	Erosion hazard	Windthrow hazard	Equipment limitation	Remarks
White pine, red pine, black walnut, black locust, tulip-poplar, white ash.	Slight	Moderate	Slight	Slight	Slight	Among best timber-producing soils in State.
White pine, black walnut, tulip-poplar, black locust.	Slight. (See Remarks.)	Moderate	Slight	Slight	Slight	Occasional flooding often benefits establishment of seedlings, especially cottonwood, sycamore, and red maple. Most woodcrops are in relatively narrow strips bordering major streams.
White pine, red pine, black walnut, tulip-poplar, black locust.	Slight except on steeper slopes that have southern exposure.	Moderate	Moderate on slopes steeper than 18 percent.	Slight	Moderate or severe. (See Remarks.)	Not practical to use regular farm equipment for logging on slopes steeper than 18 percent.
White pine, baldcypress, red maple, white ash, sweetgum.	Severe because of excessive flooding and ponding.	Severe	Slight	Severe	Severe. (See Remarks.)	Logging late in winter and early in spring is impractical because of extreme wetness; generally causes damage to tree roots and soil structure.

TABLE 3.—*Suitability of the*

Group	Species	Site index [1]	Estimated yearly growth [2]	Species in natural stands: Most desirable	Acceptable	Least desirable
Group 2w13: Ne	Pin oak Sweetgum Tulip-poplar Virginia pine White pine	85–95 80–90 85–95 85–95 [3] 80–90	300–375 260–335 300–375 300–375 [3] 260–375	Sweetgum, red maple, swamp chestnut oak, pin oak, tulip-poplar.	Sycamore, white oak, swamp white oak, cottonwood, river birch.	White elm, hickory, beech, blackgum.
Group 3d7: CoF	Upland oaks Tulip-poplar	65–75 80–90	155–220 260–335	Red oak, white oak, chinquapin oak, black walnut, tulip-poplar, white ash.	Sugar maple, basswood, red-cedar, blue ash, post oak, beech.	White elm, honey-locust, osage-orange, hickory, buckeye.
Group 3d9: BnA, BnB2, BnB3, PeA, PeB2, ScA, ScB2, TlB2, ZaC2, ZaC3, ZaD2.	Upland oaks Tulip-poplar Virginia pine White pine	70–80 85–95 70–80 80–90	185–260 300–375 185–260 260–335	White oak, white ash, tulip-poplar, chestnut oak.	Scarlet oak, black oak, sugar maple, sweetgum.	Hickory, blackgum, white elm, beech.
Group 3o10: BeC2, BeD2, BeE2, BeF2, BmC3, BmD3, BmE3, GlD2, GlD3, GlE2, WeC2, WeC3, WeD2, WeD3.	Upland oaks Tulip-poplar Shortleaf pine White pine	70–80 90–100 70–80 70–80	185–260 335–415 185–260 185–260	White oak, black oak, red oak, tulip-poplar, white ash.	Chinquepin oak, beech, sugar maple, red elm.	White elm, hickory, buckeye, honey-locust.
Group 3r12: GpF	Upland oaks Tulip-poplar Virginia pine	70–80 70–80 50–60	185–260 185–260 90–130	White oak, black oak, red oak, tulip-poplar, white ash.	Sugar maple, beech, scarlet oak, chestnut oak.	Hickory, white elm, red maple, blackgum.
Group 3r18: MaB2, MaD2, MaF, McD3.	Upland oaks Tulip-poplar White pine	70–80 85–95 [3] 70–80	185–260 300–375 [3] 185–260	White oak, black oak, bur oak, tulip-poplar, swamp chestnut oak.	Basswood, red oak, sugar maple, shingle oak, sweetgum, white ash.	Hickory, white elm, red maple, pin oak, swamp white oak.
Group 3w5: Ba, Jo, Mg, Wc	Upland oaks Pin oak Tulip-poplar Sweetgum	70–80 80–90 80–90 75–85	185–260 260–335 260–335 220–300	White ash, red maple, bur oak, pin oak, tulip-poplar, sweetgum.	Sycamore, white oak, shingle oak, river birch, swamp white oak.	White elm, beech, hickory, blackgum, boxelder.
Group 4r3: Gu	Shortleaf pine Virginia pine	[3] 72–85 [3] 53–72	200–300 100–200	Natural hardwood stands rarely, if ever, occur. Trees are planted primarily for erosion control.	Natural hardwood stands rarely, if ever, occur. Trees are planted primarily for erosion control.	Natural hardwood stands rarely, if ever, occur. Trees are planted primarily for erosion control.

See footnotes at end of table.

soils as woodland.—Continued

Species suitable for planting	Seedling mortality	Plant competition	Erosion hazard	Windthrow hazard	Equipment limitation	Remarks
White pine, bald-cypress, sycamore, red maple, white ash.	Slight	Moderate	Slight	Moderate	Moderate. (See Remarks.)	Logging is very difficult late in winter and early in spring because of a seasonal high water table; generally causes damage to shallow roots and soil structure.
White pine, red pine, Virginia pine, tulip-poplar, black walnut.	Severe on dry, rocky seedbed, and natural regeneration is poor.	Moderate	Moderate or severe. (See Remarks.)	Moderate; shallow root systems because of depth to bedrock.	Moderate because slope and stones on surface make logging difficult.	Moderately steep to very steep slopes and shallow soil depth to bedrock help cause erosion. Gullies usually do not form but the soil washes out from between the stones.
White pine, shortleaf pine, red pine, Virginia pine, tulip-poplar, white ash.	Slight	Slight	Moderate. (See Remarks.)	Moderate because the restrictive layer in soil profile causes shallow rooting.	Slight	The restrictive layer cuts down on water storage and in places causes excessive runoff of water.
White pine, red pine, shortleaf pine, tulip-poplar, white ash.	Slight	Moderate; satisfactory reproduction will form well-stocked stands.	Slight or moderate. (See Remarks.)	Slight	Moderate where slopes are more than 12 percent.	Erosion is a severe hazard on steeper slopes during and following logging.
White pine, red pine, Virginia pine.	Moderate on southern exposures because of shortage of available moisture.	Slight	Moderate on moderately steep and steep slopes and moderately deep soils.	Slight or moderate.	Moderate or severe because of slope and stoniness.	
White pine, red pine, tulip-poplar, white ash.	Slight	Moderate	Moderate or severe.	Slight	Moderate on escarpments.	
White pine, bald-cypress, white ash, red maple, tulip-poplar, sycamore.	Slight with some difficulty occurring in exceptionally wet years.	Moderate	Slight	Slight	Moderate. (See Remarks.)	Logging is impractical late in winter and early in spring because of wetness and causes damage to tree roots and soil structure.
Red pine, Virginia pine, shortleaf pine, white pine, black locust, European black alder.	Moderate; plantings can result in only 50 percent survivals with adverse weather.	Slight	Severe; equipment activity on these areas tends to reactivate old gullies.	Slight because of extreme depth of root zone.	Severe because of steep and eroded topography.	Represents the severely eroded part of the deep-profile soils. However, adequate stands can be obtained only through planting.

TABLE-3.—*Suitability of the*

Group	Species	Site index [1]	Estimated yearly growth [2]	Species in natural stands		
				Most desirable	Acceptable	Least desirable
Group 4r16: Qu	Shortleaf pine Virginia pine	[3] 72–85 [3] 53–72	[3] 200–300 [3] 100–200	Cottonwood, sycamore, red maple, green ash.	Sassafras, red oak, redcedar, white ash, black cherry, river birch.	White elm, aspen, black willow, boxelder, honey-locust.
Group 5r14: WbF	Virginia pine Shortleaf pine.	[3] 45–53 [3] 53–72	[3] 75–100 [3] 100–200	Natural hardwood stands rarely, if ever, occur. Redcedar, persimmon, and sassafras seed in some areas, but only in very light stands. Trees are planted primarily for erosion control.	Natural hardwood stands rarely, if ever, occur. Redcedar, persimmon, and sassafras seed in some areas, but only in very light stands. Trees are planted primarily for erosion control.	Natural hardwood stands rarely, if ever, occur. Redcedar, persimmon, and sassafras seed in some areas, but only in very light stands. Trees are planted primarily for erosion control.

[1] The height reached by dominant trees in a stand at the age of 50 years.

soils as woodland.—Continued

Species suitable for planting	Seedling mortality	Plant competition	Erosion hazard	Windthrow hazard	Equipment limitation	Remarks
pH 5.5–7.0: sweetgum, tulip-poplar, black walnut, sycamore, European black alder, cottonwood, white pine, shortleaf pine. pH 4.0–5.5: sycamore, sweetgum, European black alder, river birch, jack pine, Virginia pine, pitch pine, white pine.	Slight; the rough topography tends to catch wind-distributed tree seeds and hold on area until germination takes place.	Slight; tree roots can develop rather deeply because of the loose soil condition.	Moderate on the steep and broken topography. During the first few years after the areas are abandoned, erosion tends to help level steep ridges.	Slight	Severe; very difficult logging situation. Special logging equipment needed to harvest the crop. In many cases, it is necessary to construct access roads prior to logging.	Represents the quarries in the county which are not generally satisfactory for tree production.
Virginia pine, pitch pine, shortleaf pine.	Moderate; can reach as high as 50 percent on exposed parent material and south slopes.	Slight	Severe because of depth to bedrock.	Moderate or severe depending on depth of rooting zone.	Severe because of frequent gullies and stones.	

[2] Board feet per acre—Doyle's Rule. [3] Estimated.

The site index rating for upland oaks, for example, is based on data obtained from USDA Technical Bulletin No. 560 (*8*), and the site index rating for tulip-poplar is based on data assembled in 1957 for the Forest Service. Site index ratings for sweetgum, red gum, and pin oak are from a 1959 Forest Service paper by W. M. Broadfoot (*3*). (The sweetgum curve in the paper was also used for data on pin oak.) The rating for Virginia pine was obtained from an article in North Carolina Agricultural Experiment Station Technical Bulletin No. 100 (1953) (*10*). The rating for shortleaf pine was from USDA Miscellaneous Publication No. 50 (1929) (*11*), and the rating for white pine was obtained from a research note by W. T. Doolittle (1960) (*4*).

A symbol is assigned to each woodland group. This symbol will prove valuable to local landowners, and also be comparable to other lands within Indiana or in the midwest part of the United States. An example of a woodland group symbol for Harrison County is 3d9. The first number of the symbol indicates the productive potential of soils in the group. The productivity class 1 is highest for the particular woodland crop, followed by classes 2, 3, 4, and so on, to include the entire site index range for each forest type. The second category of the symbol indicates a subclass based on selected soil characteristics that cause important hazards or limitations to use or management of woodland. The subclasses in Harrison County are: *w*, which indicates excessive wetness or soils where excessive water is present seasonally or year long; *d*, which indicates restricted rooting depth; *r*, which indicates limitations solely because of steepness; and *o*, which indicates slight or no limitations to woodland use or management. The third category is a number indicating the placement of the mapping units grouped on a statewide numbering system.

In table 3 the soils of the county are listed according to woodland group. Each group is then characterized according to yields and suitability for certain species of trees. The site index averages are converted to board feet (Doyle's rule) to make data more useful to local landowners. Yields for site indexes 50 through 80 were developed from USDA Bulletin No. 560 (*8*), as adapted by Case, Gingrich, and Lloyd in 1962. Yields for site indexes 90 to 110 were developed from data in USDA Handbook No. 181 (*7*), as adapted by Case in 1962. These yield data are the estimated potential production for fully stocked, even-aged, managed stands that have average yearly growth.

For each woodland group, ratings are given for the factors affecting the limitations and hazards of the soils for woodland use. The factors are seedling mortality, plant competition, erosion hazard, windthrow hazard, and equipment limitations.

Seedling mortality refers to the expected degree of mortality of natural-seeded plants or planted seedlings as influenced by the kind of soil, degree of erosion, and direction of slope. The rating is slight if natural regeneration ordinarily is adequate. The rating is moderate if natural regeneration cannot always be relied upon for adequate and immediate restocking. It is severe if considerable replanting, special preparation of seedbed, and use of superior planting techniques are required to assure satisfactory stands.

Plant competition refers to the invasion of growth of undesirable species on different kinds of soil when openings are made in canopy. The rating is slight if competition will not prevent adequate natural regeneration and early growth or interfere with planted seedlings. The rating is moderate if competition will delay natural or artificial regeneration but will not prevent eventual development of fully stocked stands. It is severe if competition will prevent adequate stands unless intensive site preparation and maintenance treatments are used.

Erosion hazard refers to the potential of soil erosion that may occur following cutting operations and where the soil is exposed, as along roads, skid trails, fire lanes, and log-decking areas. Soil characteristics that affect the erosion hazard are slope, stability or soil aggregates, infiltration, permeability, and coarse fragments. The rating is slight if the erosion hazard is negligible. The rating is moderate if the erosion hazard requires attention and practices to be applied for control. It is severe if the erosion hazard is great enough to require intensive management for control.

Windthrow hazard is an evaluation of soil characteristics that control the development of tree roots and, therefore, affect resistance to wind. The rating is slight if no special hazards are recognized, and individual trees remain standing when released on all sides. The rating is moderate if root development is adequate for stability, except during periods of excessive wetness or great wind velocity. It is severe if the depth of tree rooting does not give adequate stability, and individual trees are likely to be blown over if released on all sides. It is extremely important that landowners understand this hazard if they plan to thin a stand of trees for use as homesites or park and recreational areas.

Equipment limitation is an evaluation of soil characteristics and topographic features that restrict or prohibit the use of conventional equipment for planting and harvesting wood crops, for constructing roads, and for controlling fires. The rating is slight if there are no restrictions in kind of equipment used or in the time of year it is used. The rating is moderate if seasonal restriction is less than three months, or some moderate restrictions are present because of slope, wetness, rockiness, or other physical characteristics. It is severe if there is a seasonal restriction on operating machinery for more than three months of the year, or other extreme restrictions exist because of steepness or extreme wetness. This type of limitation commonly requires detailed scheduling of logging, and it sometimes requires specially adapted equipment.

Recreation

The need for outdoor recreational facilities is expected to triple by the year 2000. Because of this, outdoor recreation needs to be an integral element in local land-use planning (*5*).

The landscape and resources of Harrison County and the location of the county in relation to centers of population make it possible to develop recreational enterprises that could produce income. The most likely sources of income are hunting areas, shooting preserves, improved picnic areas, fishing waters, and water sports.

General recreational facilities have been established and are in use. Among these are the Harrison-Crawford State Forest and the nearby Wyandotte Caves in Crawford County.

Watershed development in upland areas offers a potential for multipurpose impoundments of bodies of water of different sizes. Some well-drained soils in upland areas are well suited to picnic grounds, intensive play areas, tent and camp trailer sites, and to cottages and utility buildings. The Ohio River offers opportunities for boating, water skiing, and swimming.

In table 4 the soils in Harrison County are rated according to their limitations for developing four kinds of recreational facilities. These are tent and camp trailer sites; picnic areas, parks, and extensive play areas; playgrounds, athletic fields, and other intensive play areas; and trails and paths. Information concerning the suitability of sites for buildings can be obtained from the table on engineering interpretations in the engineering section of this publication.

The ratings used in table 4 are slight, moderate, and severe. For a rating other than slight, the degree of limitations of the soil for developing a specific recreation facility is also given. A rating of *slight* means the facility is easily created, improved, or maintained, and there are few or no limitations that affect design or management. A rating of *moderate* means the facility generally can be created, improved, or maintained, but there are moderate limitations that affect design and management. A rating of *severe* means the practicability of establishing the facility is questionable. Extreme measures are needed to overcome the limitation and usage is generally unsound or not practical.

TABLE 4.—*Limitations of the soils for stated recreational uses*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series in the first column of this table]

Soil series and map symbols	Tent and camp trailer sites	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and other intensive play areas	Trails and paths
Alford: AfB, AfC2, AfF2.	Moderate where slopes are 2 to 12 percent; wet and soft after rain. Severe where slopes are 18 to 35 percent.	Moderate where slopes are 2 to 12 percent; wet and soft after rains. Severe where slopes are 18 to 35 percent.	Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 35 percent.	Slight where slopes are 2 to 12 percent. Moderate where slopes are 18 to 35 percent.
Bartle: Ba	Severe: somewhat poorly drained; very slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; wet, soft, and slow to dry after rain.	Severe: somewhat poorly drained; very slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained.
Baxter:				
BcB2, BcC2, BcD2, BeC2, BeD2, BeE2, BeF2.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 35 percent.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 35 percent.	Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 35 percent.	Slight where slopes are 2 to 12 percent. Moderate where slopes are 12 to 25 percent. Severe where slopes are 25 to 35 percent.
BlB3, BlC3	Moderate: slopes of 2 to 12 percent; sticky and slow to dry after rain.	Moderate: slopes of 2 to 12 percent; sticky and slow to dry after rain.	Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent; sticky and slow to dry after rain.	Moderate: slopes of 2 to 12 percent; sticky and slow to dry after rain.
BmC3, BmD3, BmE3	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 35 percent; 20 to 40 percent chert fragments in surface layer.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 35 percent; 20 to 40 percent chert fragments in surface layer.	Severe where slopes are 6 to 35 percent; 20 to 40 percent chert fragments in surface layer.	Moderate where slopes are 6 to 25 percent. Severe where slopes are 25 to 35 percent; 20 to 40 percent chert fragments in surface layer.
Bedford: BnA, BnB2, BnB3.	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight.
*Berks Mapped only in complex with Gilpin and Weikert soils.	Severe: slopes of 18 to 35 percent.	Severe: slopes of 18 to 35 percent.	Severe: slopes of 18 to 35 percent.	Moderate where slopes are 18 to 25 percent. Severe where slopes are 25 to 35 percent.

See footnote at end of table.

TABLE 4.—*Limitations of the soils for stated recreational uses*—Continued

Soil series and map symbols	Tent and camp trailer sites	Picnic areas, parks and extensive play areas	Playgrounds, athletic fields, and other intensive play areas	Trails and paths
Corydon: CoF	Severe: slopes of 20 to 60 percent.	Severe: slopes of 20 to 60 percent.	Severe: slopes of 20 to 60 percent.	Severe: slopes of 20 to 60 percent.
Crider: CrB2, CrC2, CsB3, CsC3.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent.	Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent.	Slight.
Elkinsville: ElA, ElB2, ElC2, ElC3.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent.	Slight.
*Gilpin: GlD2, GlD3, GlE2, GpF. For Berks part of GpF, see Berks series.	Severe: slopes of 12 to 30 percent.	Severe: slopes of 12 to 30 percent.	Severe: slopes of 12 to 30 percent.	Moderate where slopes are 12 to 25 percent. Severe where slopes are 25 to 30 percent.
Gullied land: Gu, Too variable to be rated.				
Hagerstown:				
HaC2, HaD2, HaE2.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent.	Severe: slopes of 6 to 25 percent.	Slight where slopes are 6 to 12 percent. Moderate where slopes are 12 to 25 percent.
HgC3, HgD3, HgE3	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent; sticky and slow to dry after rain.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent; sticky and slow to dry after rain.	Severe: slopes of 6 to 25 percent.	Moderate: slopes of 6 to 25 percent; sticky and slow to dry after rain.
Haymond: Hm	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]
Huntington: Hu	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]
Johnsburg: Jo	Severe: somewhat poorly drained; very slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; wet, soft, and slow to dry after rain.	Severe: somewhat poorly drained; very slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; very slow permeability; wet, soft, and slow to dry after rain.
Markland:				
MaB2, MaD2, MaF	Moderate where slopes are 2 to 18 percent; slow permeability; wet, soft, and slow to dry after rain. Severe where slopes are 25 to 70 percent.	Moderate where slopes are 2 to 18 percent; wet, soft, and slow to dry after rain. Severe where slopes are 25 to 70 percent.	Moderate where slopes are 2 to 6 percent; slow permeability; wet, soft, and slow to dry after rain. Severe where slopes are 25 to 70 percent.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 12 to 18 percent. Severe where slopes are 25 to 70 percent.
McD3	Moderate: slopes of 8 to 18 percent; slow permeability; sticky and slow to dry after rain.	Moderate: slopes of 8 to 18 percent; sticky and slow to dry after rain.	Severe: slopes of 8 to 18 percent; sticky and slow to dry after rain.	Moderate: slopes of 8 to 18 percent; sticky and slow to dry after rain.
McGary: Mg	Moderate: somewhat poorly drained; slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; wet, soft, and slow to dry after rain.

See footnote at end of table.

TABLE 4.—*Limitations of the soils for stated recreational uses*—Continued

Soil series and map symbols	Tent and camp trailer sites	Picnic areas, parks and extensive play areas	Playgrounds, athletic fields, and other intensive play areas	Trails and paths
Montgomery: Mo	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.	Severe: very poorly drained.
Newark: Ne	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]	Severe: subject to flooding.[1]	Moderate: subject to flooding.[1]
Pekin: PeA, PeB2	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight.
Princeton: PrC2, PrD2	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.	Severe: slopes of 6 to 18 percent.	Slight.
Quarries: Qu. Too variable to be rated.				
Sciotoville: ScA, ScB2	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight.
Tilsit: TlB2	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight	Severe: very slow permeability; wet, soft, and slow to dry after rain.	Slight.
*Weikert: WbF. For Berks part, see Berks series.	Severe: slopes of 35 to 60 percent.	Severe: slopes of 35 to 60 percent.	Severe: slopes of 35 to 60 percent.	Severe: slopes of 35 to 60 percent.
Weinbach: Wc	Severe: somewhat poorly drained; very slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained; wet, soft, and slow to dry after rain.	Severe: somewhat poorly drained; slow permeability; wet, soft, and slow to dry after rain.	Moderate: somewhat poorly drained.
Wellston: WeC2, WeC3, WeD2, WeD3.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.	Severe: slopes of 6 to 18 percent.	Slight where slopes are 6 to 12 percent. Moderate where slopes are 12 to 18 percent.
Wheeling: WgA, WgB2, WhC2, WhC3, WhE2.	Slight where slopes are are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent.	Slight where slopes are are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent.	Slight where slopes are are 0 to 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 25 percent.	Slight where slopes are are 0 to 12 percent. Moderate where slopes are 12 to 25 percent.
Zanesville: ZaC2, ZaC3, ZaD2.	Severe: very slow permeability.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.	Severe: slopes of 6 to 18 percent; very slow permeability.	Slight where slopes are 6 to 12 percent. Moderate where slopes are 12 to 18 percent.

[1] Onsite inspection needed to determine degree and frequency of flooding.

Wildlife

The soils, topography, climate, vegetation, and other natural features of Harrison County are favorable for the development of wildlife habitat. These features provide a high potential for managing the land to increase and maintain various kinds of wildlife.

Three major kinds of wildlife recognized in Harrison County are open-land wildlife, woodland wildlife, and wetland wildlife. Most areas throughout the county have a high potential for the development of habitat for open-land wildlife and woodland wildlife, but only small localized areas have a suitable potential for the development of habitat for wetland wildlife. The three major kinds of wildlife are defined as follows:

Open-land wildlife.—These are birds, mammals, and reptiles that normally frequent cropland, pasture, and hayland that are overgrown with grasses, herbs, and shrubs. Examples of open-land wildlife are rabbits, red fox, skunk, quail, and meadowlarks. Elements of wildlife habitat used in rating soils for this kind of wildlife are limitations for growing seed and grain crops, grasses and legumes, wild herbaceous upland plants, and hardwood woodland plants.

Woodland wildlife.—These are mammals and birds that frequent areas of hardwood and coniferous trees and of shrubs or a combination of both. Examples of woodland wildlife are squirrels, deer, raccoon, woodpeckers, and nuthatches. Elements of wildlife habitat used in rating soils for this kind of wildlife are limitations for growing grasses and legumes, wild herbaceous upland plants, hardwood woodland plants, and coniferous woodland plants.

Wetland wildlife.—These are mammals, birds, and reptiles that frequent wet areas, such as ponds, marshes, and swamps. Examples of wetland wildlife are muskrats, wild ducks and geese, kingfishers, and redwinged blackbirds. Elements of wlidlife habitat used in rating soils for this kind of wildlife are limitations for growing wetland food and cover plants and seed and grain crops and limitations for shallow-water developments and excavated ponds.

In table 5 the soils in Harrison County are rated according to their limitations for providing habitat for each of the three kinds of wildlife.

A rating of *good* means habitats are generally easily created, improved, or maintained and there are few or no limitations that affect management. A rating of *fair* means habitats generally can be created, improved, or maintained, but there are moderate soil limitations that affect management. A rating of *poor* means habitats can generally be created, improved, or maintained, but there are rather severe soil limitations. A very poor limitation means it is very questionable that habitat can be created, improved, or maintained and is generally impractical under prevailing conditions.

TABLE 5.—*Interpretations of the soils for the three major kinds of wildlife*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series in the first column of this table]

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Alford: AfB, AfC2, AfF2.	Good where slopes are 2 to 12 percent. Poor where slopes are 18 to 35 percent; erosion hazard. Very poor for seed and grain crops and poor for grasses and legumes.	Good where slopes are 2 to 12 percent. Fair where slopes are 18 to 35 percent; erosion hazard. Fair for grasses and legumes.	Very poor: well drained. Very poor for wetland food and cover plants and for shallow-water developments and excavated ponds.
Bartle: Ba	Good	Fair: somewhat poorly drained Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Fair: somewhat poorly drained. Fair for wetland food and cover plants and for shallow-water developments and excavated ponds.
Baxter: BcB2, BcC2, BcD2, BeC2, BeD2, BeE2, BeF2, BlB3, BlC3, BmC3, BmD3, BmE3.	Good where slopes are 2 to 12 percent. Fair where slopes are 12 to 35 percent; erosion hazard. Very poor for seed and grain crops and fair for grasses and legumes.	Good where slopes are 2 to 12 percent. Fair where slopes are 12 to 35 percent; erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Bedford: BnA, BnB2, BnB3.	Good	Good	Poor or very poor: moderately well drained. Very poor for wetland food and cover plants and shallow-water developments, poor for excavated ponds, and fair for grain and seed crops.

TABLE 5.—*Interpretations of the soils for the three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
*Berks. Mapped only in complex with Gilpin and Weikert soils.	Poor: erosion hazard. Very poor for seed and grain crops and fair for grasses and legumes.	Fair: erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Corydon: CoF	Poor: erosion hazard. Very poor for seed and grain crops, poor for grasses and legumes, and fair for wild herbaceous upland plants and hardwood woodland plants.	Fair: erosion hazard. Poor for grasses and legumes and fair for wild herbaceous upland plants, hardwood woodland plants, and coniferous woodland plants.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Crider: CrB2, CrC2, CsB3, CsC3.	Good	Good	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds and fair for seed and grain crops.
Elkinsville: ElA, ElB2, ElC2, ElC3.	Good	Good	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds and fair for seed and grain crops.
*Gilpin: GlD2, GlD3, GlE2, GpF. For Berks part of GpF, see Berks series.	Fair: erosion hazard. Very poor for seed and grain crops and fair for grasses and legumes.	Fair: erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Gullied land: Gu. To variable to be rated.			
Hagerstown: HaC2, HaD2, HaE2, HgC3, HgD3, HgE3.	Good where slopes are 6 to 12 percent. Fair where slopes are 12 to 25 percent; erosion hazard. Very poor for seed and grain crops and fair for grasses and legumes.	Good where slopes are 6 to 12 percent. Fair where slopes are 12 to 25 percent; erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water de-developments, excavated ponds, and seed and grain crops.
Haymond: Hm	Good	Good	Very poor: well drained. Poor for wetland food and cover plants, shallow-water developments, and excavated ponds.
Huntington: Hu	Good	Good	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds.
Johnsburg: Jo	Good	Fair: somewhat poorly drained. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Fair: somewhat poorly drained. Fair for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Markland: MaB2, MaD2, MaF, McD3.	Good where slopes are 2 to 6 percent. Fair where slopes are 8 to 18 percent; erosion hazard. Fair or poor for seed and grain crops and fair for grasses, legumes, and wild herbaceous upland plants. Poor where slopes are 25 to 70 percent; very severe erosion hazard. Very poor for seed and grain crops and poor for grasses and legumes.	Good where slopes are 2 to 6 percent. Fair where slopes are 8 to 18 percent; erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure. Poor where slopes are 25 to 70 percent; very severe erosion hazard. Poor for grasses and legumes and conifers and woody plants.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds.

TABLE 5.—*Interpretations of the soils for the three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
McGary: Mg	Good	Fair: somewhat poorly drained; clayey material to a depth of 30 inches. Fair for grasses and legumes and poor for conifers and woody plants because of rapid growth rate and canopy closure.	Fair: somewhat poorly drained. Fair for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Montgomery: Mo	Poor: very poorly drained. Very poor for seed and grain crops and poor for grasses, legumes, and wild herbaceous upland plants.	Good	Good.
Newark: Ne	Fair: subject to flooding. Poor for seed and grain crops and fair for grasses, legumes, and wild herbaceous upland plants.	Fair: somewhat poorly drained. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Fair: somewhat poorly drained. Fair for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Pekin: PeA, PeB2	Good	Good	Poor or very poor: moderately well drained. Poor for wetland food and cover plants, shallow-water developments, and excavated ponds where slopes are 0 to 2 percent. Very poor for wetland food and cover plants and shallow-water developments and poor for excavated ponds where slopes are 2 to 6 percent.
Princeton: PrC2, PrD2	Good	Good	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds.
Quarries: Qu. Too variable to be rated.			
Sciotoville: ScA, ScB2	Good	Good	Poor or very poor: moderately well drained. Poor for wetland food and cover plants, shallow-water developments, and excavated ponds where slopes are 0 to 2 percent. Very poor for wetland food and cover plants and shallow-water developments and poor for excavated ponds where slopes are 2 to 6 percent.
Tilsit: TlB2	Good	Good	Poor or very poor: moderately well drained. Very poor for wetland food and cover plants and shallow-water developments, poor for excavated ponds, and moderate for grain and seed crops.
*Weikert: WbF For Berks part, see Berks series.	Very poor: steep and shallow. Very poor for seed and grain crops and hardwood woodland plants and poor for grasses and legumes and wild herbaceous upland plants.	Poor: shallow. Poor for grasses and legumes, wild herbaceous upland plants, and hardwood woodland plants and good for conifers.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.
Weinbach: Wc	Good	Fair: somewhat poorly drained. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Fair: somewhat poorly drained. Fair for wetland food and cover plants, shallow-water developments, excavated ponds, and seed and grain crops.

TABLE 5.—*Interpretations of the soils for the three major kinds of wildlife*—Continued

Soil series and map symbols	Open-land wildlife	Woodland wildlife	Wetland wildlife
Wellston: WeC2, WeC3, WeD2, WeD3.	Good where slopes are 6 to 12 percent. Fair where slopes are 12 to 18 percent; erosion hazard. Poor or very poor for seed and grain crops and fair for grasses and legumes.	Good where slopes are 6 to 12 percent. Fair where slopes are 12 to 18 percent; erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds.
Wheeling: WgA, WgB2, WhC2, WhC3, WhE2.	Good where slopes are 0 to 12 percent. Fair where slopes are 12 to 25 percent; erosion hazard. Poor for seed and grain crops and fair for grasses and legumes.	Good where slopes are 0 to 12 percent. Fair where slopes are 12 to 25 percent; erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds.
Zanesville: ZaC2, ZaC3, ZaD2.	Good where slopes are 6 to 12 percent. Fair where slopes are 12 to 18 percent; erosion hazard. Poor for seed and grain crops and fair for grasses and legumes.	Good where slopes are 6 to 12 percent. Fair where slopes are 12 to 18 percent; erosion hazard. Fair for grasses and legumes and poor for conifers because of rapid growth rate and canopy closure.	Very poor: well drained. Very poor for wetland food and cover plants, shallow-water developments, and excavated ponds.

Engineering Uses of the Soils[3]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion-control structures, drainage systems, and sewage disposal systems. Among the properties most important to engineers are permeability, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. Topography, depth to water table, and depth to bedrock are also important. The information in this section can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential and recreational sites.
2. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys of the selected locations.
3. Assist in designing drainage systems, farm ponds, diversion terraces, and other structures for soil and water conservation.
4. Locate possible sources of sand and gravel.
5. Correlate performance of structures with soil mapping units to develop information that can be useful in designing and maintaining new structures.
6. Determine the suitability of soils for cross-county movements of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

It is not intended that this survey will eliminate the need for onsite sampling and testing of soils for design and construction of specified works and uses. The interpretations in the soil survey should be used primarily in planning more detailed field investigations to determine the condition of soil material in place at the proposed site.

Only the data in table 6 are from actual laboratory tests. The estimates in tables 7 and 8 are based on a comparison of soils with those tested. At many construction sites, major variations in the soil may be present within the depth of the proposed excavations, and in places several soils occur within a short distance. Specific laboratory data on engineering properties of the soil should be determined for the soil at the site before any engineering work is planned in detail.

Some terms used by the soil scientist may be unfamiliar to the engineer. Other terms, for example, soil, clay, silt, sand, aggregate, and granular, have special meanings in soil science. Most of these terms, as well as other special terms that are used in the soil survey, are defined in the Glossary.

Information useful in engineering can be obtained from the soil map. It will often be necessary, however, to refer to other parts of the survey. By using the information in the soil map, the soil profile descriptions, and the tables in this section, the engineer can plan a detailed survey of the soil at the construction site.

Engineering classification systems

Two systems for classification of soils are in general use among engineers. Most highway engineers classify soil material according to the system used by the American Association of State Highway Officials. Other engineers prefer to use the Unified soil classification system. Both

[3] MAX L. EVANS, area engineer, Soil Conservation Service, assisted in the preparation of this section.

TABLE 6.—*Engineering*

[Tests performed by Soils and Pavement Design Laboratory, Joint Highway Research Project, School of Civil Engineering, Roads, in accordance with standard procedures of

Soil name and location	Parent material	SCS report No. S-66-Ind-31-	Depth	Horizon	Moisture-density data [1]	
					Maximum dry density	Optimum moisture
			In		*Lbs per cu ft*	*Pct*
Baxter cherty silt loam: SE¼ NW¼ sec. 17, T. 2 S., R. 4 E. (Modal)	Impure limestone, upland.	5-1	1-5	A2	92. 6	27. 5
		5-2	10-29	B22t	91. 3	28. 5
		5-3	29-51	B23t	91. 2	28. 5
Bedford silt loam: NW¼ NW¼ sec. 33, T. 1 S., R. 4 E. (Modal)	Loess on limestone, upland.	3-1	0-9	Ap	92. 5	27. 5
		3-2	15-25	B21t	103. 6	20. 0
		3-3	25-34	Bx1	96. 4	24. 5
		3-4	40-76	IIB22t	99. 5	22. 5
Crider silt loam: SW¼ NE¼ sec. 8, T. 5 S., R. 3 E. (Modal)	Loess on limestone, upland.	6-1	0-8	Ap	94. 1	26. 5
		6-2	13-23	B21t	98. 7	23. 0
		6-3	30-48	IIB23t	98. 8	22. 5
NW¼ NE¼ sec. 33, T. 1 S., R. 4 E. (Cherty substratum)	Loess on limestone, upland.	2-1	0-8	Ap	94. 9	26. 0
		2-2	17-25	B21t	102. 6	21. 0
		2-3	33-60	IIB23t	87. 1	31. 5
Elkinsville silt loam: NW¼ NW¼ sec. 2, T. 4 S., R. 3 E. (Modal)	Alluvium, terrace.	7-1	0-10	Ap	96. 0	25. 0
		7-2	23-37	B22t	96. 7	24. 5
		7-3	45-58	C1	100. 5	22. 0
Johnsburg silt loam: SW¼ NW¼ sec. 28, T. 1 S., R. 4 E. (Modal)	Loess on limestone, upland.	4-1	3-8	A2	82. 0	33. 5
		4-2	13-21	B2t	102. 3	21. 0
		4-3	21-51	IIBx	104. 0	20. 0

[1] Based on the Moisture-density Relations of Soils Using 5.5-lb. Rammer and 12-in. Drop, AASHO Designation T 99, Method A (*1*), and one-point determination.

[2] Mechanical analyses according to the AASHO Designation T 88 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the

test data

Purdue University, in cooperation with Indiana State Highway Commission and the U.S. Department of Commerce, Bureau of Public the American Association of State Highway Officials (*1*)]

Mechanical analysis [2]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHO [3]	Unified [4]
¾-in	⅜-in	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm				
											Pct			
76	66	58	44	40	--------	40	39	32	15	10	33	5	A-4(8)	SC
------	100	95	89	84	--------	80	79	78	68	65	74	46	A-7-6(20)	CH
100	85	78	70	70	--------	66	65	64	57	53	69	35	A-7-6(20)	CH-MH
------	------	--------	--------	100	--------	94	90	77	36	26	30	6	A-4(8)	ML
------	------	--------	--------	100	--------	98	96	82	46	37	30	17	A-6(11)	CL
------	------	--------	--------	100	--------	94	91	79	45	39	37	15	A-6(10)	CL-ML
------	------	100	96	93	--------	77	73	68	54	50	42	25	A-7-6(14)	CL
------	------	--------	--------	--------	--------	100	100	91	40	30	32	6	A-4(8)	ML
------	------	--------	--------	--------	--------	100	94	82	45	38	41	17	A-7-6(11)	CL-ML
------	------	--------	--------	100	100	98	96	80	52	45	39	17	A-6(11)	CL
------	------	--------	100	99	--------	96	92	75	35	26	32	8	A-4(8)	CL-ML
------	------	--------	--------	100	--------	97	94	79	42	35	40	18	A-6(11)	CL
------	------	100	95	94	--------	92	90	88	77	76	78	47	A-7-5(20)	MH
------	------	--------	--------	100	--------	89	81	58	30	23	29	4	A-4(8)	ML
------	------	--------	--------	100	--------	97	95	72	37	32	32	9	A-4(8)	CL-ML
------	------	--------	--------	100	--------	99	97	79	46	39	36	14	A-6(10)	CL
------	------	100	94	91	--------	78	72	65	33	25	39	7	A-4(8)	ML
------	------	100	99	97	--------	95	92	75	37	30	36	15	A-6(10)	CL
100	99	99	88	85	--------	78	75	65	36	30	41	21	A-7-6(13)	CL

pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[3] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145-49 (*1*).

[4] Based on the Unified Soil Classification System (*14*).

TABLE 7.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series in the first column of this table.

Soil series and map symbols	Depth to bedrock	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO
	Inches	*Inches*			
Alford: AfB, AfC2, AfF2	>120	0–17	Silt loam	ML	A–4
		17–50	Silt loam	CL	A–6
		50–72	Silt loam and silts	ML or CL	A–4 or A–6
Bartle: Ba	>120	0–28	Silt loam	ML or CL	A–4
		28–64	Silty clay loam	CL	A–6
		64–72	Thin layers of silty clay loam, silt loam, loam, and fine sand.	ML or CL	A–4
Baxter: BcB2, BcC2, BcD2, BeC2, BeD2, BeE2, BeF2, BlB3, BlC3, BmC3, BmD3, BmE3.	60–120	0–8	Silt loam	ML	A–4
		8–20	Silty clay loam to cherty silty clay loam.	CL	A–6 or A–7
		20–72	Silty clay to clay	CH	A–7
Bedford: BnA, BnB2, BnB3	60–120	0–15	Silt loam	ML or CL	A–4
		15–25	Silty clay loam	CL	A–6
		25–40	Silty clay loam	CL	A–7
		40–72	Silty clay	CH	A–7
*Berks Mapped only in complex with Gilpin and Weikert soils.	20–36	0–11	Channery silt loam	GM or ML	A–2 or A–4
		11–32	Channery silt loam	GM	A–2
		32	Sandstone.		
Corydon: CoF	10–20	0–9	Stony silt loam	ML or CL	A–4
		9–18	Silty clay	CL or CH	A–6 or A–7
		18	Limestone.		
Crider: CrB2, CrC2, CsB3, CsC3	60–120	0–8	Silt loam	ML	A–4
		8–26	Silty clay loam	CL or CH	A–6 or A–7
		26–72	Silty clay	CH	A–7
Elkinsville: ElA, ElB2, ElC2, ElC3	>120	0–18	Silt loam	ML	A–4
		18–62	Silty clay loam to clay loam	CL	A–6
		62–72	Layers of silt loam, silty clay loam, and fine sand.	ML	A–4
*Gilpin: GlD2, GlD3, GlE2, GpF For Berks part of GpF, see Berks series.	20–36	0–12	Silt loam to gritty silt loam	ML	A–4
		12–29	Gritty silt loam	CL	A–6
		29	Sandstone.		
Gullied land: Gu. Too variable to be rated.					
Hagerstown: HaC2, HaD2, HaE2, HgC3, HgD3, HgE3.	40–60	0–6	Silt loam	ML or CL	A–4
		6–16	Silty clay loam	CL	A–7
		16–52	Silty clay	CH	A–7
Haymond: Hm	>72	0–22	Silt loam	ML	A–4
		22–72	Silt loam, some sandy layers	ML	A–4
Huntington: Hu	>180	0–72	Silt loam	ML	A–4
Johnsburg: Jo	48–96	0–11	Silt loam	ML	A–4
		11–22	Silty clay loam	CL	A–6
		22–38	Heavy silt loam	CL	A–6
		38–72	Silty clay loam, sandy clay loam	CL	A–6
Markland: MaB2, MaD2, MaF, McD3.	>180	0–7	Silt loam	ML or CL	A–6
		7–30	Silty clay loam, silty clay	CH	A–7
		30–72	Silty clay, clay	CH	A–7

See footnote at end of table.

significant to engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for The symbol > means more than; the symbol < means less than]

Percentage passing sieve— No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Permeability	Available water capacity	Reaction	Frost-damage potential	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH*		
95–100	95–100	85–95	0.63–2.0	0.17–0.20	6.1–6.5	High	Low.
95–100	90–95	80–90	0.63–2.0	0.17–0.20	5.1–5.5	Moderate to high	Moderate.
95–100	90–95	85–95	0.63–2.0	0.17–0.20	6.6–7.3	Moderate to high	Low.
95–100	90–95	70–80	0.63–2.0	0.17–0.20	5.6–6.5	High	Low.
100	95–100	80–90	<0.06	[1] 0.06–0.08	4.5–5.0	Moderate	Low.
100	90–100	75–85	0.2–0.63	[1] 0.17–0.19	4.5–5.0	Moderate	Low.
95–100	95–100	85–95	0.63–2.0	0.17–0.20	5.6–6.5	Moderate to high	Low.
70–80	60–70	50–65	0.63–2.0	0.18–0.21	4.5–5.5	Moderate	Moderate.
70–80	60–70	50–65	0.63–2.0	0.18–0.21	4.5–5.0	Moderate	Moderate.
95–100	95–100	90–95	0.63–2.0	0.17–0.19	5.1–6.5	Moderate to high	Low to moderate.
95–100	95–100	85–95	0.2–0.63	0.18–0.21	4.5–5.0	Moderate	Moderate.
95–100	90–95	80–90	<0.06	[1] 0.06–0.08	4.5–5.0	Moderate	Moderate.
100	95–100	75–95	0.06–0.2	[1] 0.18–0.21	4.5–5.0	Moderate	Moderate.
55–65	50–60	25–55	0.63–2.0	0.12–0.17	5.1–6.0	Low	Low.
35–45	30–40	25–35	0.63–2.0	0.12–0.17	4.5–5.0	Low	Low.
95–100	95–100	85–95	0.63–2.0	0.17–0.20	6.6–7.3	Low	Low.
95–100	90–100	80–90	0.2–0.63	0.18–0.21	6.1–7.3	Low	Moderate.
95–100	95–100	85–95	0.63–2.0	0.17–0.20	6.1–6.5	Moderate to high	Low.
95–100	90–100	80–95	0.63–2.0	0.18–0.21	5.1–6.0	Low to moderate	Moderate.
100	90–100	75–95	0.63–2.0	0.18–0.21	4.5–5.5	Low	Moderate.
100	95–100	75–95	0.63–2.0	0.17–0.20	5.1–6.5	Moderate	Low.
100	95–100	75–85	0.63–2.0	0.18–0.21	4.5–5.5	Moderate	Low.
100	95–100	75–85	0.63–2.0	0.17–0.20	4.5–5.0	Moderate	Low.
95–100	95–100	90–100	0.63–2.0	0.17–0.2	5.6–6.0	Moderate	Low.
95–100	95–100	90–100	0.63–2.0	0.17–0.20	4.5–5.0	Moderate	Low.
95–100	95–100	85–95	0.63–2.0	0.17–0.20	6.1–6.5	Moderate to high	Low.
95–100	90–100	80–90	0.63–2.0	0.18–0.21	5.1–5.5	Moderate	Moderate.
95–100	90–100	75–95	0.63–2.0	0.18–0.21	5.1–6.0	Moderate	Moderate.
100	95–100	90–100	0.63–2.0	0.17–0.20	6.6–7.3	Moderate to high	Low.
100	95–100	90–100	0.63–2.0	0.17–0.20	6.6–7.3	Moderate to high	Low.
100	100	95–100	0.63–2.0	0.17–0.20	6.6–7.3	Moderate	Low
95–100	95–100	85–95	0.63–2.0	0.17–0.20	5.1–6.5	High	Low.
95–100	90–100	80–90	0.2–0.63	0.18–0.21	4.5–5.0	Moderate	Low to moderate.
95–100	90–100	80–95	<0.06	[1] 0.06–0.08	4.5–5.0	Moderate	Low to moderate.
95–100	90–100	80–90	0.63–2.0	[1] 0.18–0.21	<4.5–5.0	Moderate	Low to moderate.
95–100	95–100	90–95	0.63–2.0	0.17–0.20	6.1–6.5	High	Moderate.
95–100	95–100	75–95	0.06–0.2	0.18–0.21	5.1–6.0	Moderate	High.
95–100	95–100	75–95	0.06–0.2	0.18–0.21	Calcareous	Moderate	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to bedrock	Depth from surface	Classification		
			USDA texture	Unified	AASHO
	Inches	*Inches*			
McGary: Mg	>180	0–8	Silt loam	ML or CL	A–6
		8–30	Silty clay loam, silty clay	CH	A–7
		30–72	Silty clay, clay	CH	A–7
Montgomery: Mo	60–120	0–18	Silty clay loam	CL or CH	A–7
		18–39	Silty clay	CH or CL	A–7
		39–72	Clay loam	CH	A–7
Newark: Ne	>180	0–72	Silt loam	ML	A–4
Pekin: PeA, PeB2	>120	0–31	Silt loam to light silty clay loam	ML or CL	A–4 or A–6
		31–49	Silt loam	CL	A–6
		49–72	Layers of silt loam, silty clay loam, and fine sands.	ML or CL	A–4 or A–6
Princeton: PrC2, PrD2	>120	0–11	Fine sandy loam	SM or ML	A–4
		11–31	Sandy clay loam	SC	A–4
		31–72	Fine sandy loam with bands of fine sand.	SM	A–4
Quarries: Qu. Too variable to be rated.					
Sciotoville: ScA, ScB2	>180	0–23	Silt loam	ML or CL	A–4
		23–60	Heavy silt loam to clay loam	ML or CL	A–4 or A–6
		60–72	Silty clay loam grading to stratified loams and silts.	ML or CL	A–4 or A–6
Tilsit: TIB2	48–72	0–25	Silt loam	ML	A–4
		25–46	Silt loam to silty clay loam	ML or CL	A–4 or A–6
		46–66	Silty clay loam	CL	A–6
		66	Shale sandstones.		
*Weikert: WbF. For Berks part, see Berks series.	8–20	0–18	Channery silt loam	GM	A–2
		18	Sandstone.		
Weinbach: Wc	>180	0–23	Silt loam to silty clay loam	ML or CL	A–4
		23–39	Silty clay loam	CL	A–6
		39–72	Silty clay loam grading to layers of silts and sandy materials.	ML or CL	A–4
Wellston: WeC2, WeC3, WeD2, WeD3.	36–60	0–15	Silt loam	ML	A–4
		15–40	Silt loam, silty clay loam	ML or CL	A–6
		40	Sandstone and shale.		
Wheeling: WgA, WgB2, WhC2, WhC3, WhE2.	>180	0–13	Silt loam	ML	A–4
		13–48	Clay loam	CL	A–6
		48–72	Stratified sandy clay loam, loamy sand.	ML or SM	A–2 or A–4
Zanesville: ZaC2, ZaC3, ZaD2	48–72	0–11	Silt loam	ML	A–4
		11–29	Silty clay loam	ML or CL	A–6
		29–50	Silt loam	CL	A–6
		50–65	Silt loam, loam	ML or CL	A–4
		65	Sandstone, shale.		

[1] Fragipan limits water available to the plants by restricting water movement and root penetration.

significant to engineering—Continued

Percentage passing sieve— No. 10 (2.0 mm)	Percentage passing sieve— No. 40 (0.42 mm)	Percentage passing sieve— No. 200 (0.074 mm)	Permeability	Available water capacity	Reaction	Frost-damage potential	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH*		
95–100	95–100	85–90	0. 63–2. 0	0. 17–0. 20	6. 1–6. 5	High	Moderate.
95–100	95–100	90–95	<0. 2	0. 18–0. 21	4. 5–6. 0	Moderate	High.
95–100	95–100	90–95	<0. 2	0. 18–0. 21	6. 1 to calcareous.	Moderate	High.
100	95–100	80–90	0. 2–0. 63	0. 18–0. 21	6. 6–7. 3	High	Moderate to high.
100	95–100	75–95	<0. 2	0. 18–0. 21	6. 6–7. 3	High	Moderate to high.
100	95–100	85–95	<0. 2	0. 18–0. 21	6. 6–7. 3	Moderate	Moderate to high.
100	100	85–95	0. 63–2. 0	0. 17–0. 20	5. 6–7. 3	Moderate to high	Low.
100	95–100	75–95	0. 63–2. 0	0. 17–0. 20	4. 5–7. 3	High	Low.
100	90–100	75–90	<0. 06	[1] 0. 06–0. 08	4. 5–5. 0	Moderate	Low.
100	95–100	70–85	0. 63–2. 0	[1] 0. 17–0. 20	4. 5–5. 0	Moderate	Low.
100	95–100	40–60	2. 0–6. 3	0. 12–0. 17	6. 6–7. 3	Low	Low.
95–100	75–90	40–50	0. 63–2. 0	0. 18–0. 21	6. 1–6. 5	Low	Low.
100	55–65	40–50	6. 3–20. 0	<0. 08	5. 1–7. 3	Low	Low.
95–100	95–100	80–90	0. 63–2. 0	0. 17–0. 20	5. 6–6. 5	High	Low to moderate.
100	95–100	80–90	<0. 06	[1] 0. 06–0. 08	5. 1–5. 5	High	Moderate.
100	95–100	90–100	0. 63–2. 0	[1] 0. 17–0. 20	5. 1–5. 5	High	Moderate.
100	95–100	85–95	0. 63–2. 0	0. 17–0. 20	4. 5–6. 5	High	Low.
100	95–100	80–95	<0. 06	[1] 0. 06–0. 08	<4. 5–5. 0	Moderate	Low.
100	95–100	80–90	0. 2–0. 63	[1] 0. 17–0. 20	<4. 5	Moderate	Low.
45–55	30–50	25–35	2. 0–6. 3	0. 12–0. 17	4. 5–5. 0	Low	Low.
95–100	95–100	85–95	0. 63–2. 0	0. 17–0. 20	5. 1–6. 5	High	Low to moderate.
95–100	90–100	80–90	<0. 06	[1] 0. 06–0. 08	4. 5–5. 0	High	Moderate.
95–100	85–100	75–90	0. 2–0. 63	[1] 0. 17–0. 20	4. 5–5. 0	Moderate to high	Moderate.
95–100	95–100	90–100	0. 63–2. 0	0. 17–0. 20	5. 6–6. 0	High	Low.
95–100	95–100	90–100	0. 63–2. 0	0. 17–0. 20	5. 1–5. 5	Moderate to high	Moderate.
100	95–100	95–100	0. 63–2. 0	0. 17–0. 20	6. 1–7. 3	Moderate	Low.
100	95–100	90–100	0. 63–2. 0	0. 18–0. 21	5. 1–5. 5	Moderate	Moderate.
100	90–100	30–60	0. 63–2. 0	0. 17–0. 21	4. 5–5. 0	Moderate	Low.
100	95–100	85–95	0. 63–2. 0	0. 17–0. 20	5. 1–7. 3	High	Low.
100	95–100	80–95	0. 63–2. 0	0. 17–0. 20	4. 5–5. 5	Moderate	Moderate.
100	95–100	80–90	<0. 06	[1] 0. 06–0. 08	4. 5–5. 0	Moderate	Low.
100	95–100	90–100	0. 63–2. 0	[1] 0. 17–0. 20	4. 5–5. 0	Low	Low.

TABLE 8.—*Interpretations of engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils for referring to other series

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Drainage for crops and pasture	Pond reservoir areas
Alford: AfB, AfC2, AfF2	Good	Poor in subsoil: moderate shrink-swell potential; medium to high compressibility; fair shear strength. Poor in substratum: low shrink-swell potential; medium compressibility; poor shear strength; subject to frost heave.	Subject to frost heave; cuts and fills needed; highly erodible if exposed on embankments.	Not needed	Moderate permeability.
Bartle: Ba	Fair: moderate organic-matter content.	Fair to poor in subsoil and substratum: fair stability and compaction; medium to high compressibility; low shrink-swell potential; subject to frost heave.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Seasonal high water table; very slow permeability in fragipan.	Nearly level; seasonal high water table; very slow permeability in fragipan.
Baxter: BcB2, BcC2, BcD2, BeC2, BeD2, BeE2, BeF2, BlB3, BlC3, BmC3, BmD3, BmE3.	Fair to poor: low organic-matter content; some chert fragments.	Very poor in subsoil and substratum: fair to poor stability and compaction; high compressibility; moderate shrink-swell potential; poor shear strength.	Cuts and fills needed; highly erodible if exposed on embankments; plastic materials.	Not needed	Subject to seepage in underlying limestone bedrock.
Bedford: BnA, BnB2, BnB3.	Fair: low organic matter content; limited quantity of suitable material.	Poor in subsoil: fair stability and compaction; medium to high compressibility; moderate shrink-swell potential; fair shear strength. Very poor in substratum; fair to poor stability and compaction; high compressibility; moderate shrink-swell potential; poor shear strength.	Subject to frost heave; cuts and fills needed; highly erodible if exposed on embankments; plastic materials.	Not needed	Subject to seepage in underlying limestone bedrock.
*Berks Mapped only in complex with Gilpin and Weikert soils.	Poor: high content of channery material.	Good in subsoil and substratum	Bedrock at a depth of 20 to 36 inches; cuts and fills needed.	Not needed	Moderate permeability; bedrock at a depth of 20 to 36 inches.
Corydon: CoF	Poor: bedrock at a shallow depth.	Not suitable as source	Bedrock at a depth of 10 to 20 inches; cuts and fills needed.	Not needed	Not needed
Crider: CrB2, CrC2, CsB3, CsC3.	Good	Poor in subsoil and substratum: fair to poor stability and compaction; medium to high compressibility; moderate shrink-swell potential; poor shear strength.	Subject to frost heave; cuts and fills needed; highly erodible if exposed on embankments; plastic materials.	Not needed	Subject to seepage in underlying limestone bedrock.

See footnote at end of table.

properties of the soils

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions in the first column of this table]

Soil features affecting—Continued			Soil limitations for—	
Dikes, levees, and pond embankments	Terraces and diversions [1]	Grassed waterways	Foundations for low buildings	Septic-tank filter fields
Subsoil: fair to good stability and compaction; low permeability if compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength. Substratum: fair to poor stability and compaction; low to moderate permeability if compacted; medium compressibility; fair to poor resistance to piping; low shrink-swell potential; poor shear strength.	All features favorable.	All features favorable.	Medium to high compressibility; fair shear strength in subsoil, poor in substratum.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 35 percent.
Subsoil and substratum: fair stability and compaction; low to moderate permeability if compacted; medium to high compressibility; fair resistance to piping; low shrink-swell potential; fair to poor shear strength.	Not needed	Not needed	Somewhat poorly drained; seasonal high water table; medium to high compressibility; fair to poor shear strength.	Severe: very slow permeability; seasonal high water table.
Subsoil and substratum: fair to poor stability and compaction; low permeability if compacted; high compressibility; good resistance to piping; moderate shrink-swell potential; poor shear strength.	Not needed	Not needed	Poor shear strength; moderate shrink-swell potential; high compressibility.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 35 percent.
Subsoil: fair stability and compaction; low permeability if compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength. Substratum: fair to poor stability and compaction; low permeability if compacted; high compressibility; good resistance to piping; moderate shrink-swell potential; poor shear strength.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Subsoil: fair shear strength; moderate shrink-swell potential; medium to high compressibility. Substratum: poor shear strength; moderate shrink-swell potential; high compressibility.	Severe: very slow permeability.
Subsoil and substratum: fair stability and compaction; moderate permeability if compacted; slight compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.	Not needed	Not needed	Slight compressibility; bedrock at a depth of 20 to 36 inches.	Severe: bedrock at a depth of 20 to 36 inches.
Bedrock at a depth of 10 to 20 inches	Not needed	Not needed	Bedrock at a depth of 10 to 20 inches; medium to high compressibility; moderate shrink-swell potential.	Severe: bedrock at a depth of 10 to 20 inches.
Subsoil and substratum: fair to poor stability and compaction; low permeability if compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; poor shear strength.	Not needed	Not needed	Poor shear strength; moderate shrink-swell potential; medium to high compressibility.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Drainage for crops and pasture	Pond reservoir areas
Elkinsville: ElA, ElB2, ElC2, ElC3.	Good	Fair to poor in subsoil and substratum: fair to poor stability and compaction; medium to high compressibility; low shrink-swell potential; subject to frost heave; fair to poor shear strength.	Subject to frost heave; cuts and fills needed; highly erodible if exposed on embankments.	Not needed	Moderate permeability.
*Gilpin: GlD2, GlD3, GlE2, GpF. For Berks part of GpF, see Berks series.	Good	Fair in subsoil: fair stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave; bedrock at a depth of 20 to 36 inches.	Bedrock at a depth of 20 to 36 inches; cuts and fills needed; subject to frost heave.	Not needed	Moderate permeability; bedrock at a depth of 20 to 36 inches.
Gullied land: Gu. Too variable to be rated.					
Hagerstown: HaC2, HaD2, HaE2, HgC3, HgD3, HgE3.	Good	Poor in subsoil and substratum: fair stability and compaction; medium to high compressibility; moderate shrink-swell potential; fair shear strength.	Cuts and fills needed; highly erodible if exposed on embankments; plastic materials.	Not needed	Subject to seepage in underlying limestone bedrock.
Haymond: Hm	Good	Fair in subsoil and substratum: poor stability and compaction; medium compressibility; low shrink-swell potential; fair to poor shear strength; subject to frost heave.	Subject to flooding; subject to frost heave.	Not needed	Nearly level; moderate permeability; subject to flooding.
Huntington: Hu	Good	Fair in subsoil and substratum: fair stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave.	Subject to flooding; subject to frost heave.	Not needed	Nearly level; moderate permeability; subject to flooding.
Johnsburg: Jo	Fair: low organic-matter content; fragipan at a depth of 18 to 30 inches.	Poor in subsoil and substratum: fair to good stability and compaction; medium to high compressibility; fair shear strength; low to moderate shrink-swell potential; subject to frost heave.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Seasonal high water table; very slow permeability in fragipan.	Nearly level; seasonal high water table.
Markland: MaB2, MaD2, MaF, McD3.	Fair: low organic-matter content.	Very poor in subsoil and substratum: fair to poor stability and compaction; high compressibility; high shrink-swell potential; poor shear strength.	Cuts and fills needed; plastic materials; high shrink-swell potential; poor shear strength.	Not needed	All features favorable.
McGary: Mg	Fair: low organic-matter content.	Very poor in subsoil and substratum: fair to poor stability and compaction; high compressibility; high shrink-swell potential; poor shear strength.	Somewhat poorly drained; plastic materials; subject to frost heave; high shrink-swell potential.	Seasonal high water table; slow to very slow permeability.	Nearly level; seasonal high water table.

See footnote at end of table.

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Dikes, levees, and pond embankments	Terraces and diversions [1]	Grassed waterways	Foundations for low buildings	Septic-tank filter fields
Subsoil and substratum: fair to poor stability and compaction; moderate to low permeability if compacted; medium to high compressibility; fair resistance to piping; low shrink-swell potential; fair to poor shear strength.	Not needed	Not needed	Fair to poor shear strength; low shrink-swell potential; medium to high compressibility.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.
Subsoil: fair stability and compaction; moderate permeability if compacted; medium compressibility; fair to poor resistance to piping; low shrink-swell potential; fair shear strength; bedrock at a depth of 20 to 36 inches.	Not needed	Not needed	Bedrock at a depth of 20 to 36 inches; subject to sliding; fair shear strength.	Severe: bedrock at a depth of 20 to 36 inches.
Subsoil and substratum: fair to poor stability and compaction; low permeability if compacted; medium to high compressibility; good resistance to piping; moderate shrink-swell potential; fair shear strength.	Not needed	Not needed	Fair shear strength; moderate shrink-swell potential; medium to high compressibility.	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent.
Subsoil and substratum: poor stability and compaction; moderate permeability if compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair to poor shear strength.	Not needed	Not needed	Subject to flooding; medium compressibility; fair to poor shear strength.	Severe: subject to flooding.
Subsoil and substratum: fair stability and compaction; moderate permeability if compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.	Not needed	Not needed	Subject to flooding; medium compressibility; fair shear strength.	Severe: subject to flooding.
Subsoil and substratum: fair to good stability and compaction; low permeability if compacted; medium to high compressibility; good resistance to piping; low to moderate shrink-swell potential; fair shear strength.	Not needed	Not needed	Somewhat poorly drained; very slow permeability; seasonal high water table; medium to high compressibility; fair shear strength.	Severe: very slow permeability; seasonal high water table.
Subsoil and substratum: fair to poor stability and compaction; low permeability if compacted; high compressibility; good resistance to piping; high shrink-swell potential; poor shear strength.	Clayey subsoil, difficult to vegetate.	Clayey subsoil, difficult to vegetate.	Poor shear strength; high shrink-swell potential; high compressibility.	Severe: slow permeability.
Subsoil and substratum: fair to poor stability and compaction; low permeability if compacted; high compressibility; good resistance to piping; high shrink-swell potential; poor shear strength.	Not needed	Not needed	Somewhat poorly drained; slow to very slow permeability; high shrink-swell potential; high compressibility; seasonal high water table.	Severe: slow to very slow permeability; seasonal high water table.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Drainage for crops and pasture	Pond reservoir areas
Montgomery: Mo	Fair: wet and somewhat clayey.	Poor in subsoil and substratum: fair stability and compaction; medium to high compressibility; moderate to high shrink-swell potential; poor shear strength.	Very poorly drained; plastic materials; seasonal high water table; moderate to high shrink-swell potential; subject to frost heave.	Seasonal high water table; slow to very slow permeability.	Nearly level; subject to seepage in underlying limestone bedrock; seasonal high water table.
Newark: Ne	Good	Fair in subsoil and substratum: poor stability and compaction; medium compressibility; low shrink-swell potential; fair shear strength; subject to frost heave.	Subject to flooding; subject to frost heave.	Seasonal high water table; subject to flooding.	Nearly level; moderate permeability; seasonal high water table.
Pekin: PeA, PeB2	Fair: moderate organic-matter content.	Poor in subsoil and substratum: fair stability and compaction; medium compressibility; fair to poor shear strength; low shrink-swell potential; subject to frost heave.	Subject to frost heave.	Not needed	Some seepage in substratum.
Princeton: PrC2, PrD2	Fair: moderate organic-matter content; droughty.	Fair in subsoil and substratum: fair stability; fair to good compaction; slight compressibility; fair to good shear strength; low shrink-swell potential.	Cuts and fills needed; unstable materials; highly erodible if exposed on embankments.	Not needed	Rapid seepage in substratum.
Quarries: Qu. Too variable to be rated.					
Sciotoville: ScA, ScB2	Good	Poor in subsoil and substratum: fair stability and compaction; medium to high compressibility; fair shear strength; moderate shrink-swell potential; subject to frost heave.	Subject to frost heave; medium compressibility.	Not needed	Moderate permeability in substratum.
Tilsit: TlB2	Good	Poor in subsoil and substratum: fair stability and compaction; medium to high compressibility; fair shear strength; subject to frost heave.	Cuts and fills needed; highly erodible if exposed on embankments; subject to frost heave.	Not needed	Moderate permeability in substratum; bedrock at a depth of 4 to 6 feet.
*Weikert: WbF. For Berks part, see Berks series.	Poor: bedrock at a shallow depth.	Not suitable as source	Bedrock at a depth of 8 to 20 inches; cuts and fills needed.	Not needed	Not needed

See footnote at end of table.

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Dikes, levees, and pond embankments	Terraces and diversions [1]	Grassed waterways	Foundations for low buildings	Septic-tank filter fields
Subsoil and substratum: fair stability and compaction; low permeability if compacted; medium to high compressibility; good resistance to piping.	Not needed	Not needed	Poor shear strength; moderate to high shrink-swell potential; medium to high compressibility; very poorly drained; slow to very slow permeability; seasonal high water table.	Severe: slow to very slow permeability; seasonal high water table.
Subsoil and substratum: poor stability and compaction; moderate permeability if compacted; medium compressibility; poor resistance to piping; low shrink-swell potential; fair shear strength.	Not needed	Not needed	Subject to flooding; seasonal high water table; medium compressibility; fair shear strength.	Severe: subject to flooding; seasonal high water table.
Subsoil and substratum: fair stability and compaction; low to moderate permeability if compacted; medium compressibility; fair resistance to piping; low shrink-swell potential; fair to poor shear strength.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Fair to poor shear strength; low shrink-swell potential; medium to high compressibility.	Severe: very slow permeability.
Subsoil: fair stability; fair to good compaction; moderate permeability if compacted; slight compressibility; fair resistance to piping; low shrink-swell potential; fair to good shear strength.	Topography is dune-like with short slopes.	Not needed	All features favorable	Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 18 percent.
Subsoil and substratum: fair stability and compaction; low permeability if compacted; medium to high compressibility; fair resistance to piping; moderate shrink-swell potential; fair shear strength.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Fair shear strength; moderate shrink-swell potential; medium to high compressibility.	Severe: very slow permeability.
Subsoil and substratum: fair stability and compaction; low to moderate permeability if compacted; medium to high compressibility; fair resistance to piping; fair shear strength.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Fair shear strength; medium to high compressibility.	Severe: very slow permeability.
Bedrock at a depth of 8 to 20 inches	Not needed	Not needed	Bedrock at a depth of 8 to 20 inches.	Bedrock at a depth of 8 to 20 inches.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—		
	Topsoil	Road fill	Highway location	Drainage for crops and pasture	Pond reservoir areas
Weinbach: Wc	Good	Poor in subsoil and substratum: fair to good stability and compaction; medium to high compressibility; fair shear strength; moderate shrink-swell potential; subject to frost heave.	Somewhat poorly drained; subject to frost heave; seasonal high water table.	Seasonal high water table; very slow permeability.	Nearly level; seasonal high water table.
Wellston: WeC2, WeC3, WeD2, WeD3.	Good	Poor in subsoil and substratum: fair stability and compaction; medium compressibility; fair shear strength; moderate shrink-swell potential; subject to frost heave.	Cuts and fills needed; subject to frost heave; bedrock at a depth of 3 to 5 feet.	Not needed	Moderate permeability; bedrock at a depth of 3 to 5 feet.
Wheeling: WgA, WgB2, WhC2, WhC3, WhE2.	Good	Fair in subsoil and substratum: fair stability and compaction; medium compressibility; fair shear strength; subject to frost heave.	Cuts and fills needed; highly erodible if exposed on embankments; subject to frost heave.	Not needed	Moderate permeability.
Zanesville: ZaC2, ZaC3, ZaD2.	Good	Poor in subsoil and substratum: fair stability and compaction; medium to high compressibility; fair shear strength; subject to frost heave.	Cuts and fills needed; highly erodible if exposed on embankments; subject to frost heave.	Not needed	Moderate permeability in substratum; bedrock at a depth of 4 to 6 feet.

[1] This practice not recommended on slopes greater than 12 percent.

properties of the soils—Continued

Soil features affecting—Continued			Soil limitations for—	
Dikes, levees, and pond embankments	Terraces and diversions [1]	Grassed waterways	Foundations for low buildings	Septic-tank filter fields
Subsoil and substratum: fair stability and compaction; low permeability if compacted; medium to high compressibility; fair resistance to piping; moderate shrink-swell potential; fair shear strength.	Not needed	Not needed	Somewhat poorly drained; very slow permeability; fair shear strength; medium to high compressibility; seasonal high water table.	Severe: very slow permeability.
Subsoil and substratum: fair stability and compaction; low to moderate permeability if compacted; medium compressibility; fair resistance to piping; moderate shrink-swell potential; fair shear strength.	All features favorable.	All features favorable.	Fair shear strength; moderate shrink-swell potential; medium compressibility; bedrock at a depth of 3 to 5 feet.	Moderate: bedrock at a depth of 3 to 5 feet. Severe where slopes are more than 12 percent.
Subsoil and substratum: fair stability and compaction; moderate permeability if compacted; medium compressibility; poor resistance to piping; fair shear strength.	All features favorable.	All features favorable.	All features favorable.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are 12 to 25 percent.
Subsoil and substratum: fair stability and compaction; low to moderate permeability if compacted; medium to high compressibility; fair resistance to piping; fair shear strength.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegetate fragipan if exposed.	Very slow permeability in fragipan at a depth of 18 to 30 inches; difficult to vegitate fragipan if exposed.	Fair shear strength; medium to high compressibility.	Severe: very slow permeability.

classification systems are used in this survey in tables 6 and 7 and are briefly described here.

In the system approved by the American Association of State Highway Officials (AASHO) (*1*), all soil materials are classified in seven principal groups, based on mechanical analysis and plasticity test data. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrades) to A–7 (clay soils having low strength when wet, the poorest soils for subgrades). Highly organic soils such as peat and muck are not included in this classification as their use as a construction material or foundation material should be avoided. Within each of the principal groups, the relative engineering effect of the fine-grained soil material is indicated by a group index number. The numbers range from 0 for the least amount of effect (best material) to 20 for the maximum amount of effect (poor material). In table 6 the group index number for several of the soils in Harrison County is shown in parentheses following the soil group symbol. Estimated AASHO classifications for all of the soils of the county are given in table 7.

The Unified soil classification system (*14*) was established jointly by the Corps of Engineers and the Bureau of Reclamation. This system is based on identification of coarse-grained soils according to their grain size and gradation and fine-grained soils according to their plasticity index and liquid limit. In the Unified system soil materials are identified as coarse grained (four classes), fine grained (four classes), mixed coarse and fine grained (four classes), and organics (three classes). Classifications of the soils tested according to the Unified system are given in table 6, and the estimated classification of all the soils is given in table 7.

Engineering test data

Samples of disturbed soils from five of the most important soil series of Harrison County were taken from seven locations selected by soil scientists. These samples were tested by standard procedures in the laboratories of the Joint Highway Research Project at Purdue University, under sponsorship of the Bureau of Public Roads, to assist in evaluating the soils for engineering purposes. These samples do not represent the entire range of soil characteristics in Harrison County, or even within the five soil series sampled, and not all layers of each profile were sampled. The test results, however, have been used as a general guide in estimating the enginering properties of the soils of the county.

Mechanical analyses were made by using a combination of the sieve and hydrometer methods. The liquid limit and plasticity index were determined. The results of these and the classification of each sample according to both the AASHO and the Unified systems are given in table 6.

The names for the various sizes of sand, silt, and clay as used by engineers are not equivalent to the names used by soil scientists. To soil scientists, for example, "clay" refers to mineral grains less than 0.002 millimeters in diameter, whereas engineers frequently define "clay" size as fine-grained material that plots above the "A" line on the plasticity chart.

The liquid-limit and plastic-limit tests of the soil samples measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to a semisolid to a plastic state. As the moisture content is further increased, the material changes from the plastic state to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Table 6 also gives data on the relationship between the moisture content and the compacted density of the soil, as determined by the standard methods described in AASHO Designation T 99–57(*1*). If the soil material is compacted at successively higher moisture contents, assuming that the same amount of force is used in compacting the soil, the density of the compacted material will increase until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The ovendry weight in pounds per cubic foot of the soil at the optimum moisture content is termed the maximum dry density.

Estimated properties of the soils

Table 7 gives estimates of soil properties significant in engineering for all soils in Harrison County. Since actual tests were made only for those soils listed in table 6, it was necessary to estimate the engineering properties for the rest of the soils. Estimates were based upon a comparison of these soils with those that were sampled and tested and upon experiences gained from working with and observing similarly classified soils in other areas. These estimates provide information about the soils that an engineer would otherwise have to obtain for himself, but the estimates are not a substitute for the detailed tests needed at a specific site selected for construction. The information in this table, in general, applies to a depth of 6 feet or less.

A brief explanation of the data in each column of table 7 follows:

Depth to bedrock.—The average depth in feet to bedrock is given.

Depth from surface.—Normally, only the depth for the major horizons is listed. Special horizons are listed if they have enginering properties significantly different from the adjacent horizons.

USDA texture.—The United States Department of Agriculture textural classification is based on the relative amounts of sand, silt, and clay in a soil, giving rise to basic soil textural class names such as sand, sandy loam, and clay.

Unified.—This classification of soil material is according to the Unified soil classification system (*14*).

AASHO.—This classification of soil materials in according to the system of the American Association of State Highway Officials (*1*).

Percentage passing sieves 10, 40, and 200—The values in these columns are estimates rounded off to the nearest 5 percent. When there is little gravel-size material present (No. 10 sieve), the percentage of material passing the No. 200 sieve approximates the amount of silt and clay in a soil.

Permeability.—This term refers to the downward movement of water through undisturbed soil material. (See

Glossary.) Estimates are based mostly on texture, structure, and consistence.

Available water capacity.—The capacity of a soil to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed, as in table 7, as inches per inch of soil.

Reaction.—This column lists estimated ranges in field pH values for each major horizon.

Frost-damage potential.—Frost action includes heave caused by ice lenses forming in a soil and the subsequent loss of strength as a result of excess moisture during periods of thawing. Three conditions must exist for frost action to become a major consideration: (1) a susceptible soil, (2) source of water during the freezing period, and (3) a suitable temperature gradient that persists long enough for freezing temperature to penetrate the ground.

Shrink-swell potential.—This is the quality of the soil that determines its volume change in proportion to its moisture content. The shrink-swell potential is estimated primarily on the basis of the amount and kind of clay in a soil.

Depth to seasonal high water table was not included in table 7 because most soils in the county are at a depth of more than 5 feet. The seasonal high water table is at a depth of 1 to 3 feet for Bartle, Johnsburg, McGary, Newark, and Weinbach soils and at a depth of less than 1 foot for the Montgomery soils.

Interpretations of soil properties

Table 8 gives interpretations of the suitability of soils for engineering uses. The interpretations include: (1) suitability of soils as a source of topsoil and road fill; (2) soil features affecting use for highway location, drainage for crops and pasture, pond reservoir areas, dikes, levees, pond embankments, terraces, diversions, and grassed waterways; and (3) soil limitations for foundations of low buildings and septic-tank filter fields. These interpretations apply to the representative profile of each soil series, as described in the section "Descriptions of the Soils."

Some features of a soil may be helpful in one kind of engineering work and a hindrance in another. For example, a highly permeable substratum is a feature that would render a soil undesirable as a site for a farm pond, but it might be favorable for highway location. A brief explanation of the data in each column of table 8 follows.

Topsoil.—This refers to soil material, preferably high in organic-matter content, used to topdress back slopes, embankments, lawns, gardens, and other areas. The suitability rating is based mainly on texture and organic-matter content.

Road fill.—The suitability rating is based on the performance of soil material when used as borrow for road fill. Both the subsoil and substratum are rated if they have different characteristics.

Highway location.—Soil features considered are those that affect overall performance of the soil. The entire profile is evaluated, based on an undisturbed soil without artificial drainage.

Drainage for crops and pasture.—Soil features considered are those that affect the installation and performance of surface and subsurface drainage systems. These features are texture, permeability, topography, seasonal water table, and restricting layers.

Pond reservoirs areas.—The effect of permeability on seepage is the main feature considered in the undisturbed soil.

Dikes, levees, and pond embankments.—The features considered are those that affect the use of disturbed soil for constructing embankments to impound surface water.

Terraces and diversions.—Soil features considered are those that affect the layout and construction of terraces and diversions. Such features include topography, texture, and depth to soil material not suited to crops.

Grassed waterways.—Soil features considered are those that affect the establishment, growth, and maintenance of vegetation and that affect the layout and construction of grassed waterways.

Foundations for low buildings.—The features and qualities of the undisturbed soils considered are those that affect their suitability for foundations for single-family dwellings. The substratum, which generally provides the base for foundations, is the soil material evaluated.

Septic-tank filter fields.—The factors evaluated are permeability, seasonal water table, the hazard of flooding, and topography.

The sources of sand and gravel in Harrison County are mainly in areas along the Ohio River. These materials are mostly at depths of more than 6 feet. Onsite investigations are needed to locate areas that provide sand and gravel of good quality. In the southeastern part of the county near Elizabeth is a source of sand that is part of the Ohio River Formation (*15*). This area is 1 to 2 miles wide and about 9 miles long.

Formation and Classification of Soils

This section consists of two main parts. The first explains how the factors of soil formation have affected the development of soils in Harrison County. The second explains the system of soil classification currently used and places each soil series in the classes of that system.

Factors of Soil Formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soils; (4) the relief, or lay of the land; and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life (plant life more so than animal life) are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, deter-

mines it almost entirely. Finally, time is needed for changing the parent material into a soil. It may be much or little, but some time is always required for differentiation of soil horizons. Generally, a long time is needed for distinct horizons to develop.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Parent material

The parent material from which the soils of Harrison County formed consisted of limestone, sandstone, shale, lacustrine deposits of Wisconsin age, and loess. The strata of bedrock nearest the surface are sedimentary rock of upper, middle, and lower Mississippian age.

Formations of the middle Mississippian age include St. Louis and St. Genevieve limestone, which makes up most of Harrison County. The limestone is thick enough to be quarried in most areas throughout the county. Baxter, Corydon, Crider, and Hagerstown soils formed in material weathered mainly from limestone.

This county has well-developed karst topography that is characterized by sinkholes and relatively little relief. The area is called the Mitchell Plain (*2*, *6*). Almost all the water received from rainfall in the area disappears rapidly underground through funnel-shaped sinkholes and streams. The streams that originate on the Mitchell Plain drain into swallow holes within a few miles. Caverns are common and are frequently flooded by storm waters.

Formations of the upper Mississippian age included bedded shale, sandstone, siltstone, and limestone, which is extensive in the western part of the county. Soils of the Berks, Gilpin, Wellston, Weikert, and Zanesville series formed in material weathered mainly from sandstone and shale or mudstone.

Formations of the lower Mississippian age, which are in the southeastern part of the county, include limestone and siltstone interbedded with shale. Corydon soils formed in material weathered mainly from limestone. Berks and Weikert soils formed in material weathered mainly from interbedded siltstone and shale.

In this county bedrock dips to the west at a rate of about 25 feet per mile. This dip is part of a regional structural dip that crosses the State from a high point in the southeast to a low point in the extreme southwest.

Stream terraces, or level benches above stream bottoms, occur along tributary streams and along the Ohio River. These terraces formed as a result of the increase in size of the Ohio River caused by melting of continental glaciers in the basin of the Ohio River during the Pleistocent epoch. On the Mitchell Plain are basins of old alluvial deposits in upland areas. These enclosed basins are drained by sinkholes within the basin or internally by way of underlying limestone. Soils of the Bartle and Pekin series formed on such terraces. Lacustrine terraces are along tributary streams in the southern part of the county. Soils of the Markland and McGary series formed in lacustrine deposits. Terraces that are more extensive occur along the Ohio River. Soils of the Sciotoville and Wheeling series formed on river terraces.

During the Pleistocene epoch a blanket of Peorian loess (windblown silt) was deposited over the county. The loess is as much as 10 feet thick in areas near the Ohio River, but it is thinner in other parts of the county. It generally is about 2 to 3 feet thick on ridgetops. Soils of the Alford series formed in a deep deposit of loess. Soils of the Bedford series formed in a thin mantle of loess over material weathered from limestone.

Climate

The climate of Harrison County is midcontinental. It is characterized by a wide range in temperature from summer to winter. The mean daily maximum temperature in July is about 86° F., and the mean daily minimum temperature in January is about 20°. The climate is so uniform throughout the county that differences among the soils cannot be attributed to differences in climate.

Rainfall, on the average, is 42.1 inches annually. It is well distributed throughout the year, but is slightly heavier in spring and summer than in fall and winter. The rainwater has leached plant nutrients from the surface soil and has prevented accumulation of free calcium carbonate.

Climatic forces act directly upon rocks to form the parent material from which soils form, but many of the more important soil characteristics are brought about indirectly through the influence of climate on living organisms. Without the changes brought about by the action of plants and animals, the soils would consist of residual or transported material derived from weathered rock, although some soils might have definite layers formed by the addition of alluvial or colluvial materials or by differential weathering or leaching.

Climate, acting alone on parent material, would be largely destructive. Rain and melting snow would wash the soluble material out of the soils. The processes of climate become constructive only when combined with the activities of plants and animals. Plants draw nutrients from the lower part of the soil, then, when the plants die, the nutrients are restored in varying degrees to the soil by the accumulation of decaying vegetation in the upper part. In Harrison County the climate is such that leaching progresses faster than replacement of plant nutrients. For this reason most of the soils are strongly weathered, leached, acid, and low in fertility.

Plant and animal life

Higher plants, micro-organisms, earthworms, and other forms of life that live on and in the soil contribute to soil formation. The higher plants bring moisture and plant nutrients from the lower part of the profile to the upper part and return organic matter to the soil. Bacteria and fungi cause dead vegetation to decompose into organic matter and to be incorporated into the soil.

The native vegetation of Harrison County consisted largely of hardwood trees. Trees return a comparatively small amount of organic matter to the soils. In uncleared areas of the uplands where soils of the Corydon and Weikert series occur, the surface is covered with a thin layer of litter and leaf mold, and the topmost inch or so of the soil contains a small amount of organic matter. In small areas in the county where soils of the Montgomery series occur, the native vegetation consisted of swamp grasses, sedges, and water-tolerant trees. The soils in these

areas were covered with water much of the year. The organic matter decayed slowly, and some of the organic matter accumulated.

The vegetation is fairly uniform throughout the county. Major differences among the soils, therefore, cannot be explained on the basis of differences in vegetation. Some comparatively minor variations in the vegetation are associated with different soils, but these variations are probably a result, not a cause, of differences among the soils.

Relief

Relief influences soil formation through its effect on drainage, runoff, leaching, and normal and accelerated erosion.

The relief in Harrison County ranges from nearly level on bottom lands, terraces, and upland flats to very steep on breaks. The lowest point is 374 feet above sea level where the Ohio River crosses the county line. The highest point, 972 feet above sea level, is on a ridgetop 5 miles northeast of Elizabeth.

Steep soils are not so well developed as level or sloping soils, even where they formed in the same kind of parent material. The weaker development of steep soils results from more rapid geologic erosion, less leaching, and lack of sufficient soil moisture to support a vigorous growth of plants.

Johnsburg, Tilsit, and Zanesville soils show the effects of variation in relief on the development of soils that formed in the same kind of parent material. These soils formed in a mantle of loess overlying sandstone and residuum weathered from shale. Zanesville soils, which are moderately sloping or strongly sloping, are well drained and very slowly permeable. They are brown to yellowish brown. Johnsburg soils, which are nearly level, are somewhat poorly drained and very slowly permeable. They are gray and mottled.

Time

Significant differences among the soils in Harrison County result from differences in the length of time the parent material has been undergoing the processes of soil formation.

A soil that has well-developed A and B horizons produced by the natural processes of soil formation is a mature soil. One that has little or no horizon differentiation is an immature soil. Generally, the longer the period of soil formation, the greater the degree of horizon differentiation. The effect of time, however, is modified by relief and by the nature of the parent material. Steep soils and parent material that is extremely resistent to weathering retard the development of horizons.

Most of the soils on the smoother parts of uplands and on older stream terraces are mature; that is, they have well-defined profiles. The soils on first bottoms and those that formed in local alluvium and colluvium are immature because the parent material is young and new material is deposited periodically. Steep soils are likely to be immature because geologic erosion removes soil material about as fast as it accumulates. Also, more water is lost by runoff on steep soils, and less percolates through the soil.

The oldest soils in Harrison County are those that formed in residuum weathered from limestone, sandstone, shale, and siltstone. Such soils as those of the Markland and McGary series that formed in lacustrine materials and soils that formed in sandy aeolian material of Wisconsin age are not so deeply leached nor so thoroughly leached as the soils that formed in residuum. The young soils, such as those of the Corydon and Weikert series, are shallow soils that formed in residuum and that generally are so steep that erosion nearly keeps pace with soil formation. Others are soils on bottom lands where fresh material is deposited periodically.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationship to one another and to the whole environment, and develop principles that help us understand their behavior and their response to use. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study. Readers interested in the development of the current system should refer to the latest literature available (*9*, *13*). In table 9 the soil series of Harrison County are placed in some categories of the current system.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. The criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. Most of the classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate these soil orders are those that tend to give broad climatic groupings of soils. Two exceptions are the Entisols and Histosols, which occur in many different kinds of climate. Table 9 shows the four soil orders in Harrison County: Inceptisols, Mollisols, Alfisols, and Ultisols.

Inceptisols are light-colored soils that do not have natural genetic horizons or that have only very weakly expressed beginnings of such horizons. These soils do not have traits that reflect soil mixing caused by shrinking and swelling.

Mollisols formed under grass and have a thick, dark-colored surface horizon containing colloids dominated by bivalent cations. The soil material in these soils has not been mixed by shrinking and swelling.

Alfisols are mineral soils that have horizons of accumulated clay. Unlike the Mollisols, they lack a thick, dark-

TABLE 9.—*Soil series classified according to the current system of classification*

Series	Family	Subgroup	Order
Alford	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Bartle	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Baxter	Clayey, mixed, mesic	Typic Paleudults	Ultisols.
Bedford	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Corydon	Clayey, mixed, mesic	Lithic Argiudolls	Mollisols.
Crider	Fine-silty, mixed, mesic	Typic Paleudalfs	Alfisols.
Elkinsville	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols.
Gilpin	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Hagerstown	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Haymond	Coarse-silty, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Huntington	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols.
Johnsburg	Fine-silty, mixed, mesic	Aquic Fragiudults	Ultisols.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Montgomery	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Newark	Fine-silty, mixed, nonacid, mesic	Aeric Fluventic Haplaquepts	Inceptisols.
Pekin	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Princeton [1]	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Sciotoville [2]	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Tilsit	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.
Weikert	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Weinbach	Fine-silty, mixed, mesic	Aeric Fragiaqualfs	Alfisols.
Wellston	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols.
Wheeling	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Zanesville	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols.

[1] In this county the Princeton series is dominantly a member of the coarse-loamy family.
[2] In this county the Sciotoville series is dominantly a member of the fine-silty family.

colored surface layer that contains colloids dominated by bivalent cations, but the base status of the lower horizons is not extremely low.

Ultisols are mineral soils that contain horizons of accumulated clay. Unlike the Alfisols, they have a base status of the lower horizons that is extremely low.

SUBORDER.—Each order is divided into suborders, primarily on the basis of the characteristics that seem to produce classes that have the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from climate or vegetation.

GREAT GROUPS.—Suborders are separated into great groups on basis of uniformity in the kinds and sequence of major horizons and features. The horizons considered are those in which clay, iron, or humus has accumulated or those that contain a pan that interferes with the growth of roots or movement of water. The features considered are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 9, but it is easily identified because it is the last word in the name of the subgroup.

SUBGROUPS.—Great groups are divided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the great group.

FAMILY.—Families are separated within a subgroup primarily on the basis of properties that affect the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and other properties that are used as family differentiae (see table 9). An example is the fine-silty, mixed, mesic family of Typic Fragiudults.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. They are given the name of a geographic location near the place where that series was first observed and mapped. An example is the Corydon soil.

General Nature of the County[4]

The first permanent settlement in Harrison County was established about 1800 near the present town of Lanesville. These settlers came to Harrison County, as did most others, by crossing the Ohio River from Kentucky.

The Ohio River played a major role in the early development of the county and still does. Forming the southern boundary of Harrison County, it was a natural barrier between Kentucky, which was being rapidly settled, and Indiana Territory, which later became Indiana. Yet, it served as a major transportation route for settlers into Harrison County.

[4] By GEORGE C. MILES, district conservationist, Soil Conservation Service.

Hardwood forest covered the county, game was plentiful, and an abundant water supply was available from clear springs and streams. These natural resources were an attraction to settlers, which influenced the rapid settlement of the county.

Harrison County is rich in historical lore, which marks its early development. It was organized in 1808, and Corydon was the county seat. From 1813 to 1816, Corydon was the capital of the Indiana Territory. Indiana statehood had its beginning in Harrison County, and Corydon was the first capital of the State of Indiana. Corydon was the State capital from 1816 until 1825, at which time Indianapolis became the State capital.

Forests were cleared for farmland, and farming became a major part of the economy in Harrison County. Abundant timber supplied the raw material for the sawmills, which were the early and largest industry in the county. The abundant water supply in streams furnished power for many sawmills and grist mills.

The population of Harrison County reached a peak of 21,702 in 1900, but it decreased to a low of 17,106 in 1940. By 1960, it had increased to 19,207.

Relief and Drainage

Harrison County is in an unglaciated area. Most of the soils formed in material weathered from residual limestone, but some formed in material weathered from residual sandstone. Bedrock is visible in many places, especially on valley walls and steep bluffs. Major streambeds in the county are rock.

The elevation of the county ranges from about 972 feet in section 12, T. 4 S., R. 5 E., which is near the Ohio River about 5 miles northeast of Elizabeth, to about 374 feet at the normal pool elevation of the Ohio River.

Streams of the county flow to the southwest. There are three major streams, and these drain into the Ohio River, which forms the southern boundary of the county. Blue River is on the western edge of the county and forms a major part of the boundary between Harrison and Crawford Counties. Big Indian Creek flows through the central part and drains about one-third of the county. Buck Creek drains most of the southern part of the county. Some other smaller streams drain directly into the Ohio River. A sinkhole area located in the central part and bisecting the county from north to south covers about one-third of the county and has no surface drainage pattern. Surface water enters the sinkholes and drains off underground through caves into some of the streams.

Water Supply

Water supply is a major problem for most of the county. Underground water is available in some parts, but in most places the supply is limited and not even adequate for domestic use. In many places ponds are used for livestock, but many of these ponds are not dependable and dry up during periods of drought. Some soils and cavernous limestone are subject to seepage and this makes new ponds undependable. Many springs are used as a source of water, but the flow of some of these springs is reduced or stopped during dry periods. Streams are adequate most of the year, but water for towns and industry is impounded for use during dry periods.

Transportation and Markets

Two federal highways cross the county to the east and west, U.S. Highway 150 in the north and U.S. Highway 460 in the center. State Route 135 is the major north-south highway, extending through the center of the county from a bridge over the Ohio River at Mauckport to Indianapolis. State Route 64 extends east and west through the northern third of the county. Other smaller State routes connect the towns. All towns and villages are connected by hard-surface roads. Interstate 64 is proposed across the middle of Harrison County from east to west.

A poultry dressing plant in Corydon handles most of the poultry, and a meat packing plant at Central Barren handles a large share of the cattle and hogs. A furniture manufacturing company at Corydon is a market place for the hardwoods grown in Harrison County. Louisville, Kentucky, about 25 miles east of Corydon, the county seat, is the major market for all farm products.

Climate [5]

Harrison County has an invigorating climate and four well-defined seasons. Air of both tropical and polar origin overlaps the area, resulting in frequent changes in temperature and humidity. The average annual rainfall of 42 inches is ample, and in most years it is well distributed for crops commonly grown in the county. Thunderstorms are the primary sources of rainfall in summer. The intensity of rainfall during these thunderstorms is often great enough to cause severe erosion on sloping soils that are not properly protected. Occasionally little or no rain falls for periods of up to 3 weeks in summer and early in fall. These dry periods can result in damage to crops and can significantly reduce crop growth. This is especially true for crops grown on soils that have a low or moderate available water capacity.

Relative humidity during an average summer day varies from 40 percent on a summer afternoon to 90 percent or higher just before dawn. Relative humidity rises and falls with changes in temperature during a 24-hour period, but the highest percent generally occurs with a minimum temperature and the lowest percent with the maximum temperature. In winter the most probable range of relative humidity is from 60 percent to 90 percent. Southerly winds bring higher humidities than northerly winds.

Prevailing winds are from the south, except in winter when winds from the northwest are dominant. Wind velocities at 20 feet above the ground average about 10 miles an hour in spring and about 7 miles an hour late in summer.

Based on information accumulated at Evans Landing, the average growing season of 182 days on the basis of a 32° F temperature, or 203 days on the basis of a 28° temperature, is satisfactory for crops commonly grown in the county. The average date for the last freezing temperature in spring at Evans Landing in the last 7 years was April 19. Farther north and at higher elevations in the county this date is probably 1 to 2 weeks later. In fall the average date of the first freezing temperature

[5] By LAWRENCE A. SCHAAL, State climatologist, Environmental Science Services Administration.

TABLE 10.—*Temperature and precipitation data*

[All data from Evans Landing. Statistics, except for temperature, cover the period 1923–68. Temperature is for the period 1962–68]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly maximum	Average monthly minimum	Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
	°F	*°F*	*°F*	*°F*	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	42	20	66	−8	4.3	1.3	8.5	4	2
February	43	21	66	−2	3.3	1.0	6.4	3	3
March	57	34	77	16	4.5	1.4	7.8	2	4
April	68	44	83	30	3.8	1.5	6.2	0	0
May	76	53	88	35	3.9	1.0	7.9	0	0
June	84	60	93	46	3.9	1.1	7.6	0	0
July	86	63	94	50	3.6	1.6	5.8	0	0
August	85	61	95	48	3.0	1.2	4.9	0	0
September	78	54	89	38	2.8	.9	4.9	0	0
October	71	42	84	27	2.5	.4	5.0	0	0
November	58	34	73	17	3.2	1.3	5.0	1	3
December	45	25	68	4	3.3	1.5	4.9	2	2
Year	66	43	[1] 97	[2] −10	42.1	30.8	52.6	12	3

[1] Average annual maximum. [2] Average annual minimum.

was October 18. This date would average earlier in northern and higher areas of the county. The average date for the last occurrence in spring of a 28° temperature is April 5 and for the first occurrence in fall is October 25.

The most ideal weather for outdoor activities is in fall when temperatures are most regularly in the comfortable range, showers are least, and sunshine, compared to the maximum percent possible, averages about 68 percent.

Data on temperature and precipitation are given in table 10.

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Glossary

Acidity. See Reaction, soil.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock that underlies the soil and other unconsolidated material that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Cull trees. Live trees of merchantable size but not merchantable because of defect or decay.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Gravelly soil material. From 15 to 50 percent of material, by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Limestone. Rock consisting mainly of calcium carbonate.

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification

in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Slope class. The slope classes used in this survey are as follows:

Descriptive terms	*Percent*
Nearly level	0 to 2
Gently sloping	2 to 5
Moderately sloping	5 to 9
Strongly sloping	9 to 15
Moderately steep	15 to 30
Steep	30 to 50
Very steep	50 to 75

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

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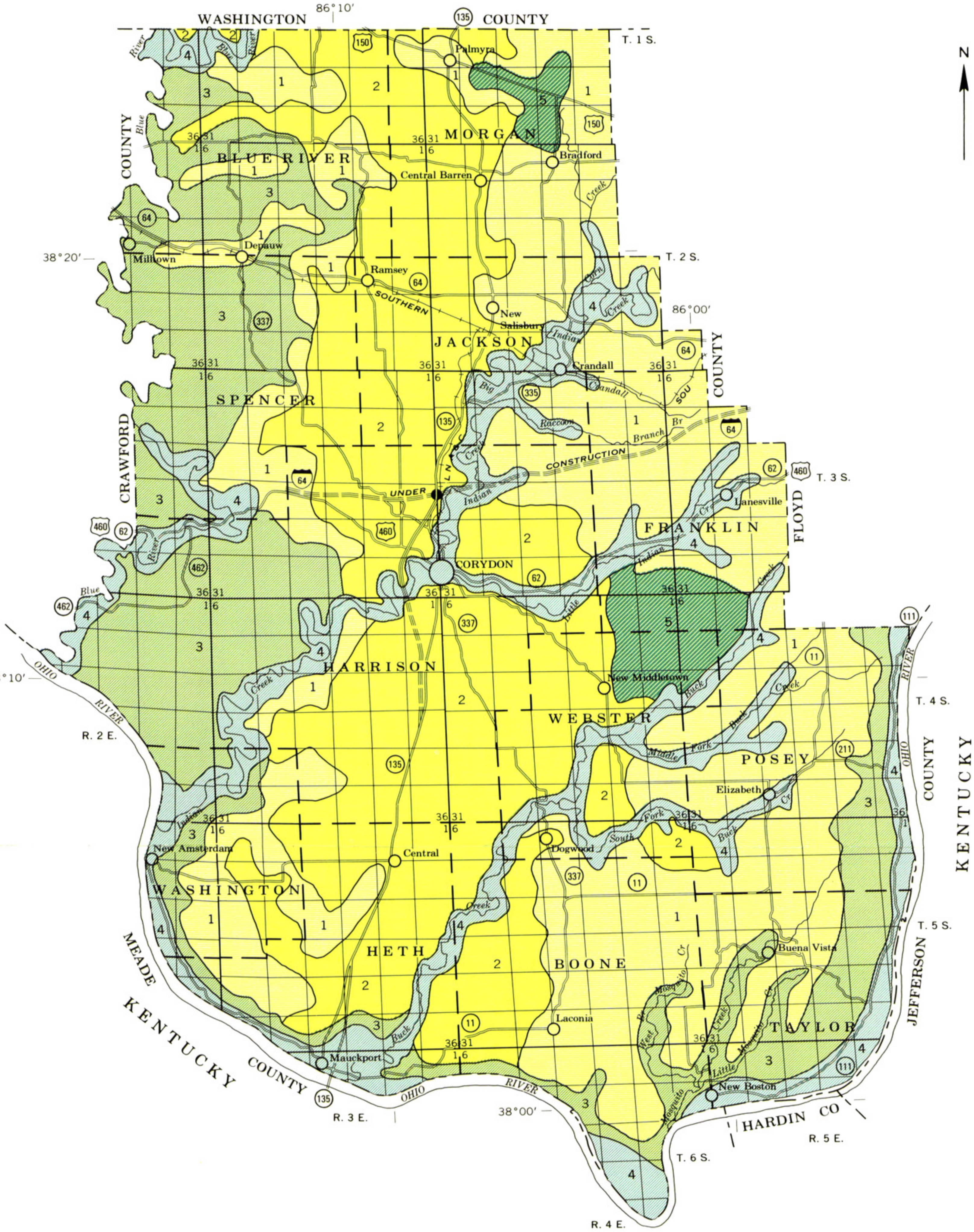


SOIL ASSOCIATIONS *

1 — Crider-Baxter association: Rolling, deep, well-drained, medium-textured, cherty soils on uplands

2 — Baxter-Crider association: Mainly rolling and hilly, deep, well-drained, medium-textured, cherty soils on uplands

3 — Corydon-Gilpin-Berks association: Steep and very steep, shallow and moderately deep, well-drained, medium-textured soils on uplands

4 — Haymond-Huntington association: Nearly level, deep, well-drained, medium-textured soils formed in alluvium on bottom lands

5 — Bedford-Bartle association: Nearly level and gently sloping, deep, moderately well drained and somewhat poorly drained, medium-textured soils with a brittle, very slowly permeable subsoil (fragipan); on uplands

* Texture terms refer to the surface layer of the major soils in each association.

Compiled 1973

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
HARRISON COUNTY, INDIANA

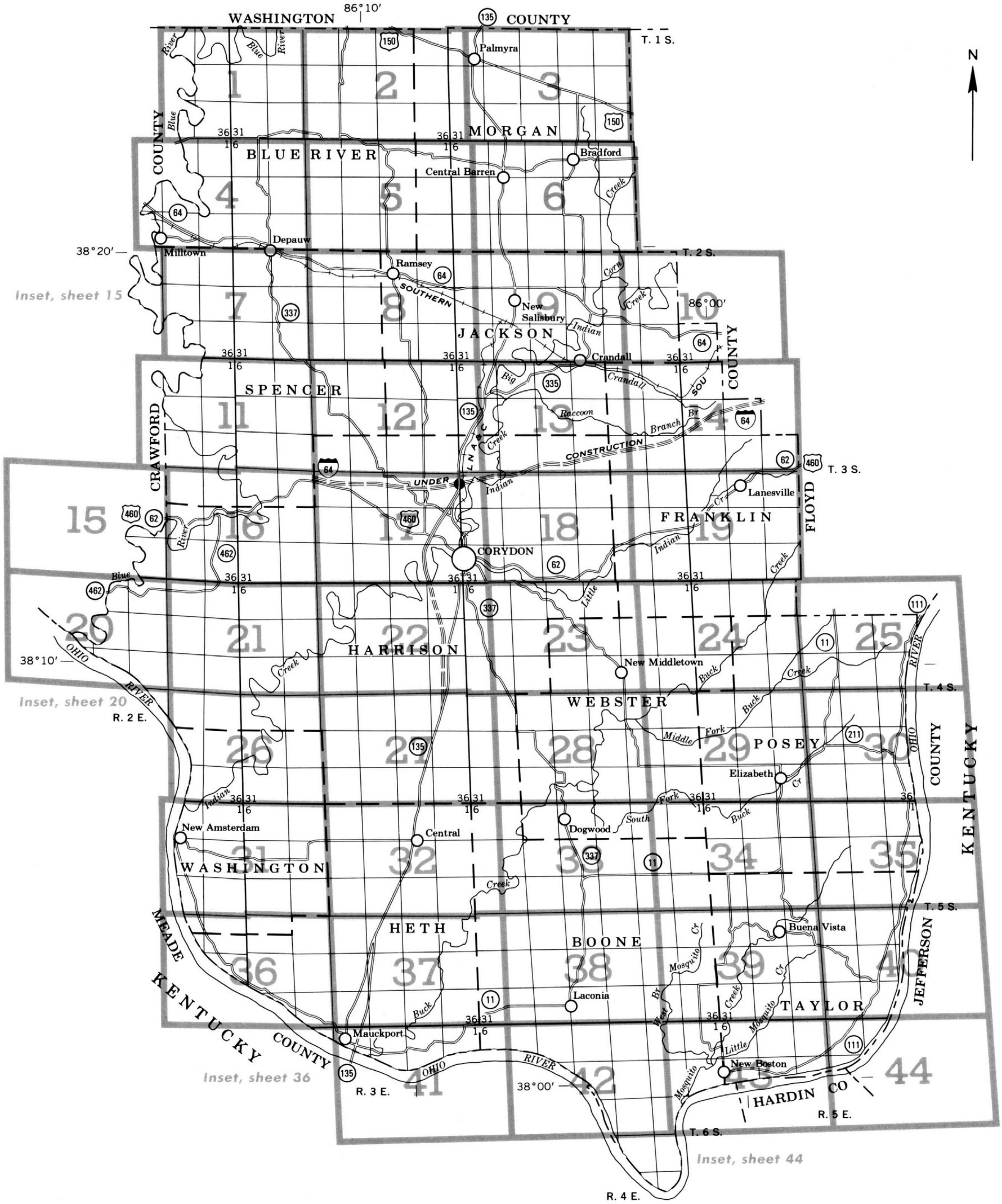
Scale 1:190,080

1 0 1 2 3 4 Miles

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
HARRISON COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number, 2 or 3, in a symbol shows that the soil is eroded or severely eroded.

SYMBOL	NAME
AfB	Alford silt loam, 2 to 6 percent slopes
AfC2	Alford silt loam, 6 to 12 percent slopes, eroded
AfF2	Alford silt loam, 18 to 35 percent slopes, eroded
Ba	Bartle silt loam
BcB2	Baxter silt loam, 2 to 6 percent slopes, eroded
BcC2	Baxter silt loam, 6 to 12 percent slopes, eroded
BcD2	Baxter silt loam, 12 to 18 percent slopes, eroded
BeC2	Baxter cherty silt loam, 6 to 12 percent slopes, eroded
BeD2	Baxter cherty silt loam, 12 to 18 percent slopes, eroded
BeE2	Baxter cherty silt loam, 18 to 25 percent slopes, eroded
BeF2	Baxter cherty silt loam, 25 to 35 percent slopes, eroded
BIB3	Baxter silty clay loam, 2 to 6 percent slopes, severely eroded
BIC3	Baxter silty clay loam, 6 to 12 percent slopes, severely eroded
BmC3	Baxter cherty silty clay loam, 6 to 12 percent slopes, severely eroded
BmD3	Baxter cherty silty clay loam, 12 to 18 percent slopes, severely eroded
BmE3	Baxter cherty silty clay loam, 18 to 25 percent slopes, severely eroded
BnA	Bedford silt loam, 0 to 2 percent slopes
BnB2	Bedford silt loam, 2 to 6 percent slopes, eroded
BnB3	Bedford silt loam, 2 to 6 percent slopes, severely eroded
CoF	Corydon stony silt loam, 20 to 60 percent slopes
CrB2	Crider silt loam, 2 to 6 percent slopes, eroded
CrC2	Crider silt loam, 6 to 12 percent slopes, eroded
CsB3	Crider soils, 2 to 6 percent slopes, severely eroded
CsC3	Crider soils, 6 to 12 percent slopes, severely eroded
EIA	Elkinsville silt loam, 0 to 2 percent slopes
EIB2	Elkinsville silt loam, 2 to 6 percent slopes, eroded
EIC2	Elkinsville silt loam, 6 to 12 percent slopes, eroded
EIC3	Elkinsville silt loam, 6 to 12 percent slopes, severely eroded
GID2	Gilpin silt loam, 12 to 18 percent slopes, eroded
GID3	Gilpin silt loam, 12 to 20 percent slopes, severely eroded
GIE2	Gilpin silt loam, 18 to 25 percent slopes, eroded
GpF	Gilpin-Berks complex, 18 to 30 percent slopes
Gu	Gullied land
HaC2	Hagerstown silt loam, 6 to 12 percent slopes, eroded
HaD2	Hagerstown silt loam, 12 to 18 percent slopes, eroded
HaE2	Hagerstown silt loam, 18 to 25 percent slopes, eroded
HgC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded
HgD3	Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded
HgE3	Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded
Hm	Haymond silt loam
Hu	Huntington silt loam
Jo	Johnsburg silt loam
MaB2	Markland silt loam, 2 to 6 percent slopes, eroded
MaD2	Markland silt loam, 8 to 18 percent slopes, eroded
MaF	Markland silt loam, 25 to 70 percent slopes
McD3	Markland silty clay loam, 8 to 18 percent slopes, severely eroded
Mg	McGary silt loam
Mo	Montgomery silty clay loam
Ne	Newark silt loam
PeA	Pekin silt loam, 0 to 2 percent slopes
PeB2	Pekin silt loam, 2 to 6 percent slopes, eroded
PrC2	Princeton fine sandy loam, 6 to 12 percent slopes, eroded
PrD2	Princeton fine sandy loam, 12 to 18 percent slopes, eroded
Qu	Quarries
ScA	Sciotoville silt loam, 0 to 2 percent slopes
ScB2	Sciotoville silt loam, 2 to 6 percent slopes, eroded
TIB2	Tilsit silt loam, 2 to 6 percent slopes, eroded
WbF	Weikert-Berks channery silt loams, 35 to 60 percent slopes
Wc	Weinbach silt loam
WeC2	Wellston silt loam, 6 to 12 percent slopes, eroded
WeC3	Wellston silt loam, 6 to 12 percent slopes, severely eroded
WeD2	Wellston silt loam, 12 to 18 percent slopes, eroded
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded
WgA	Wheeling silt loam, 0 to 2 percent slopes
WgB2	Wheeling silt loam, 2 to 6 percent slopes, eroded
WhC2	Wheeling loam, 6 to 12 percent slopes, eroded
WhC3	Wheeling loam, 6 to 12 percent slopes, severely eroded
WhE2	Wheeling loam, 12 to 25 percent slopes, eroded
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded
ZaD2	Zanesville silt loam, 12 to 18 percent slopes, eroded

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry
- Gravel pit
- Mine shaft
- Mine tunnel opening

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Lighthouse

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness: Stony; Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Cut and fill land (C.F.L.)

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables, as follows:

Acreage and extent, table 1, page 9.
Predicted yields, table 2, page 40.
Woodland, table 3, page 42.

Recreational uses, table 4, page 49.
Wildlife, table 5, page 52.
Engineering uses of the soils, table 6, page 56; table 7, page 58; and table 8, page 62.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
AfB	Alford silt loam, 2 to 6 percent slopes	8	IIe-3	34	1o1
AfC2	Alford silt loam, 6 to 12 percent slopes, eroded	8	IIIe-3	36	1o1
AfF2	Alford silt loam, 18 to 35 percent slopes, eroded	8	VIe-1	37	1r2
Ba	Bartle silt loam	10	IIw-3	34	3w5
BcB2	Baxter silt loam, 2 to 6 percent slopes, eroded	11	IIe-3	34	1o1
BcC2	Baxter silt loam, 6 to 12 percent slopes, eroded	11	IIIe-1	36	1o1
BcD2	Baxter silt loam, 12 to 18 percent slopes, eroded	11	IVe-1	37	1o1
BeC2	Baxter cherty silt loam, 6 to 12 percent slopes, eroded	11	IVe-8	38	3o10
BeD2	Baxter cherty silt loam, 12 to 18 percent slopes, eroded	11	VIe-1	39	3o10
BeE2	Baxter cherty silt loam, 18 to 25 percent slopes, eroded	12	VIe-1	39	3o10
BeF2	Baxter cherty silt loam, 25 to 35 percent slopes, eroded	12	VIIe-1	39	3o10
BlB3	Baxter silty clay loam, 2 to 6 percent slopes, severely eroded	12	IIIe-1	36	1o1
BlC3	Baxter silty clay loam, 6 to 12 percent slopes, severely eroded	12	IVe-1	37	1o1
BmC3	Baxter cherty silty clay loam, 6 to 12 percent slopes, severely eroded	12	VIe-1	39	3o10
BmD3	Baxter cherty silty clay loam, 12 to 18 percent slopes, severely eroded	12	VIIe-1	39	3o10
BmE3	Baxter cherty silty clay loam, 18 to 25 percent slopes, severely eroded	12	VIIe-1	39	3o10
BnA	Bedford silt loam, 0 to 2 percent slopes	14	IIw-5	35	3d9
BnB2	Bedford silt loam, 2 to 6 percent slopes, eroded	14	IIe-7	34	3d9
BnB3	Bedford silt loam, 2 to 6 percent slopes, severely eroded	14	IIIe-7	36	3d9
CoF	Corydon stony silt loam, 20 to 60 percent slopes	15	VIIe-2	39	3d7
CrB2	Crider silt loam, 2 to 6 percent slopes, eroded	17	IIe-3	34	1o1
CrC2	Crider silt loam, 6 to 12 percent slopes, eroded	17	IIIe-3	36	1o1
CsB3	Crider soils, 2 to 6 percent slopes, severely eroded	17	IIIe-3	36	1o1
CsC3	Crider soils, 6 to 12 percent slopes, severely eroded	17	IVe-3	38	1o1
ElA	Elkinsville silt loam, 0 to 2 percent slopes	18	I-1	33	1o1
ElB2	Elkinsville silt loam, 2 to 6 percent slopes, eroded	18	IIe-3	34	1o1
ElC2	Elkinsville silt loam, 6 to 12 percent slopes, eroded	18	IIIe-3	36	1o1
ElC3	Elkinsville silt loam, 6 to 12 percent slopes, severely eroded	18	IVe-3	38	1o1
GlD2	Gilpin silt loam, 12 to 18 percent slopes, eroded	18	VIe-1	39	3o10
GlD3	Gilpin silt loam, 12 to 20 percent slopes, severely eroded	18	VIIe-1	39	3o10
GlE2	Gilpin silt loam, 18 to 25 percent slopes, eroded	19	VIe-1	39	3o10
GpF	Gilpin-Berks complex, 18 to 30 percent slopes	19	VIIe-2	39	3r12
Gu	Gullied land	19	VIIe-4	41	4r3
HaC2	Hagerstown silt loam, 6 to 12 percent slopes, eroded	20	IIIe-3	36	1o1
HaD2	Hagerstown silt loam, 12 to 18 percent slopes, eroded	20	IVe-3	38	1o1
HaE2	Hagerstown silt loam, 18 to 25 percent slopes, eroded	20	VIe-1	39	1r2
HgC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	20	IVe-3	38	1o1
HgD3	Hagerstown silty clay loam, 12 to 18 percent slopes, severely eroded	20	VIe-1	39	1o1
HgE3	Hagerstown silty clay loam, 18 to 25 percent slopes, severely eroded	20	VIe-1	39	1r2
Hm	Haymond silt loam	22	I-2	33	1o8
Hu	Huntington silt loam	22	I-2	33	1o8
Jo	Johnsburg silt loam	23	IIIw-3	37	3w5
MaB2	Markland silt loam, 2 to 6 percent slopes, eroded	23	IIIe-11	37	3r18
MaD2	Markland silt loam, 8 to 18 percent slopes, eroded	23	VIe-1	39	3r18
MaF	Markland silt loam, 25 to 70 percent slopes	23	VIIe-1	39	3r18
McD3	Markland silty clay loam, 8 to 18 percent slopes, severely eroded	24	VIIe-1	39	3r18
Mg	McGary silt loam	24	IIIw-6	37	3w5
Mo	Montgomery silty clay loam	25	IIw-1	34	2w11
Ne	Newark silt loam	25	IIw-7	36	2w13
PeA	Pekin silt loam, 0 to 2 percent slopes	26	IIw-5	35	3d9
PeB2	Pekin silt loam, 2 to 6 percent slopes, eroded	26	IIe-7	34	3d9
PrC2	Princeton fine sandy loam, 6 to 12 percent slopes, eroded	26	IIIe-15	37	1r2
PrD2	Princeton fine sandy loam, 12 to 18 percent slopes, eroded	27	IVe-15	39	1r2
Qu	Quarries	27	VIIe-3	41	4r16
ScA	Sciotoville silt loam, 0 to 2 percent slopes	27	IIw-5	35	3d9
ScB2	Sciotoville silt loam, 2 to 6 percent slopes, eroded	28	IIe-7	34	3d9
TlB2	Tilsit silt loam, 2 to 6 percent slopes, eroded	28	IIe-7	34	3d9
WbF	Weikert-Berks channery silt loams, 35 to 60 percent slopes	29	VIIe-2	39	5r14
Wc	Weinbach silt loam	29	IIw-3	34	3w5
WeC2	Wellston silt loam, 6 to 12 percent slopes, eroded	30	IIIe-3	36	3o10
WeC3	Wellston silt loam, 6 to 12 percent slopes, severely eroded	30	IVe-3	38	3o10
WeD2	Wellston silt loam, 12 to 18 percent slopes, eroded	30	IVe-3	38	3o10
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded	30	VIe-1	39	3o10
WgA	Wheeling silt loam, 0 to 2 percent slopes	31	I-1	33	1o1
WgB2	Wheeling silt loam, 2 to 6 percent slopes, eroded	31	IIe-3	34	1o1
WhC2	Wheeling loam, 6 to 12 percent slopes, eroded	31	IIIe-3	36	1o1
WhC3	Wheeling loam, 6 to 12 percent slopes, severely eroded	31	IVe-3	38	1o1
WhE2	Wheeling loam, 12 to 25 percent slopes, eroded	31	VIe-1	39	1r2
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded	32	IIIe-7	36	3d9
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	32	IVe-7	38	3d9
ZaD2	Zanesville silt loam, 12 to 18 percent slopes, eroded	32	IVe-7	38	3d9

HARRISON COUNTY, INDIANA — SHEET NUMBER 1

HARRISON COUNTY, INDIANA NO. 1
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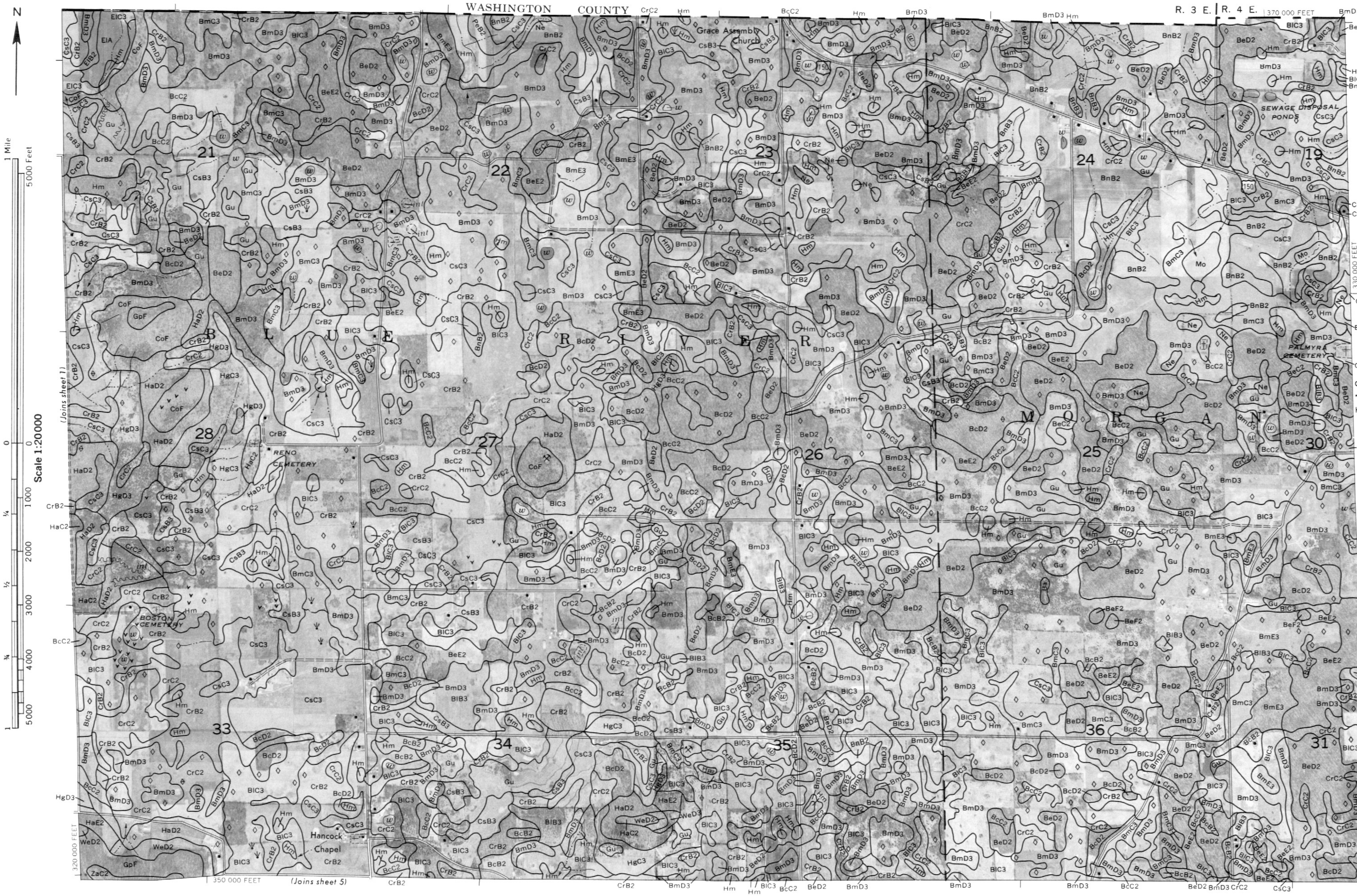
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 2



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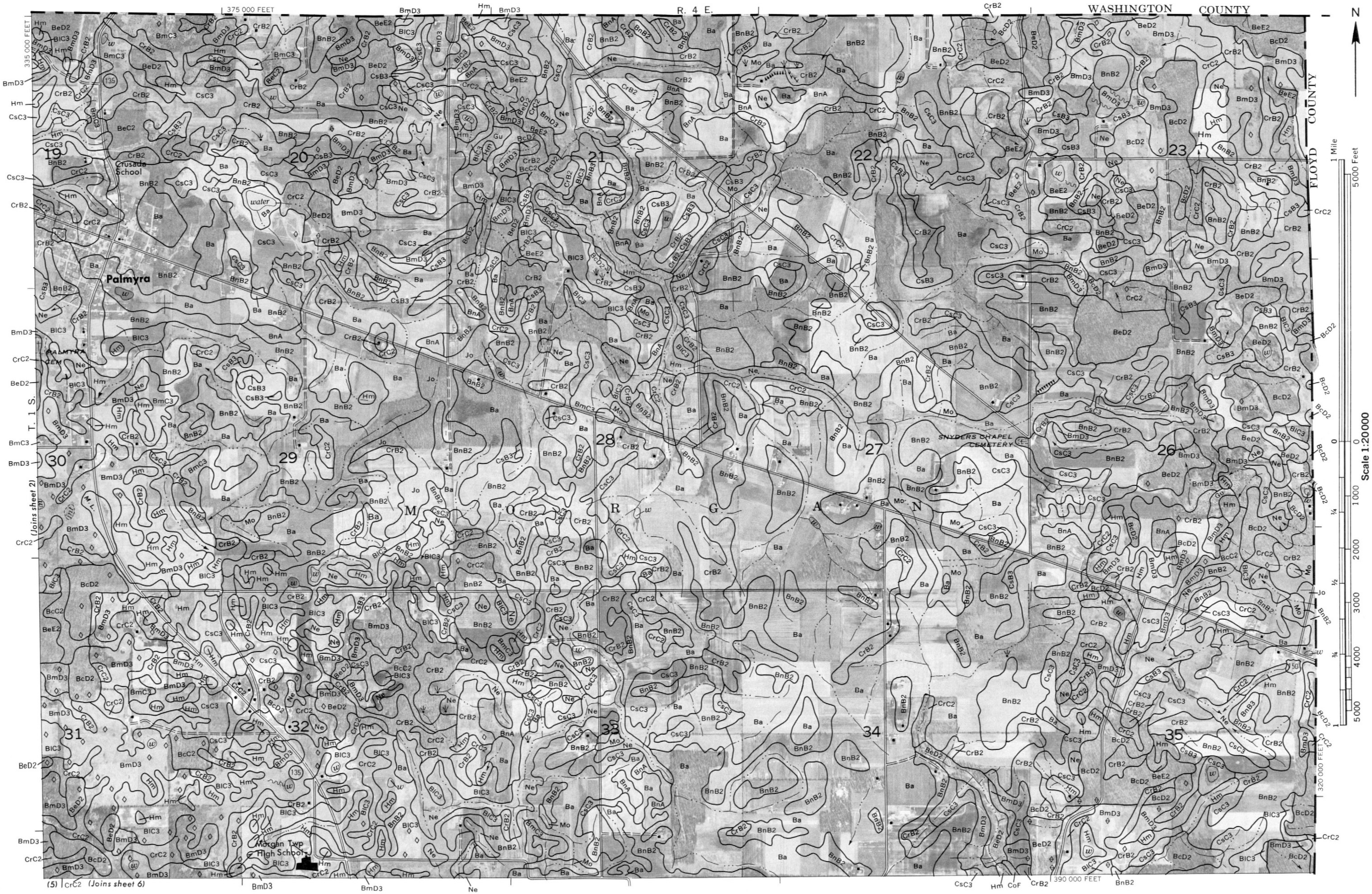
HARRISON COUNTY, INDIANA — SHEET NUMBER 3



HARRISON COUNTY, INDIANA NO. 3

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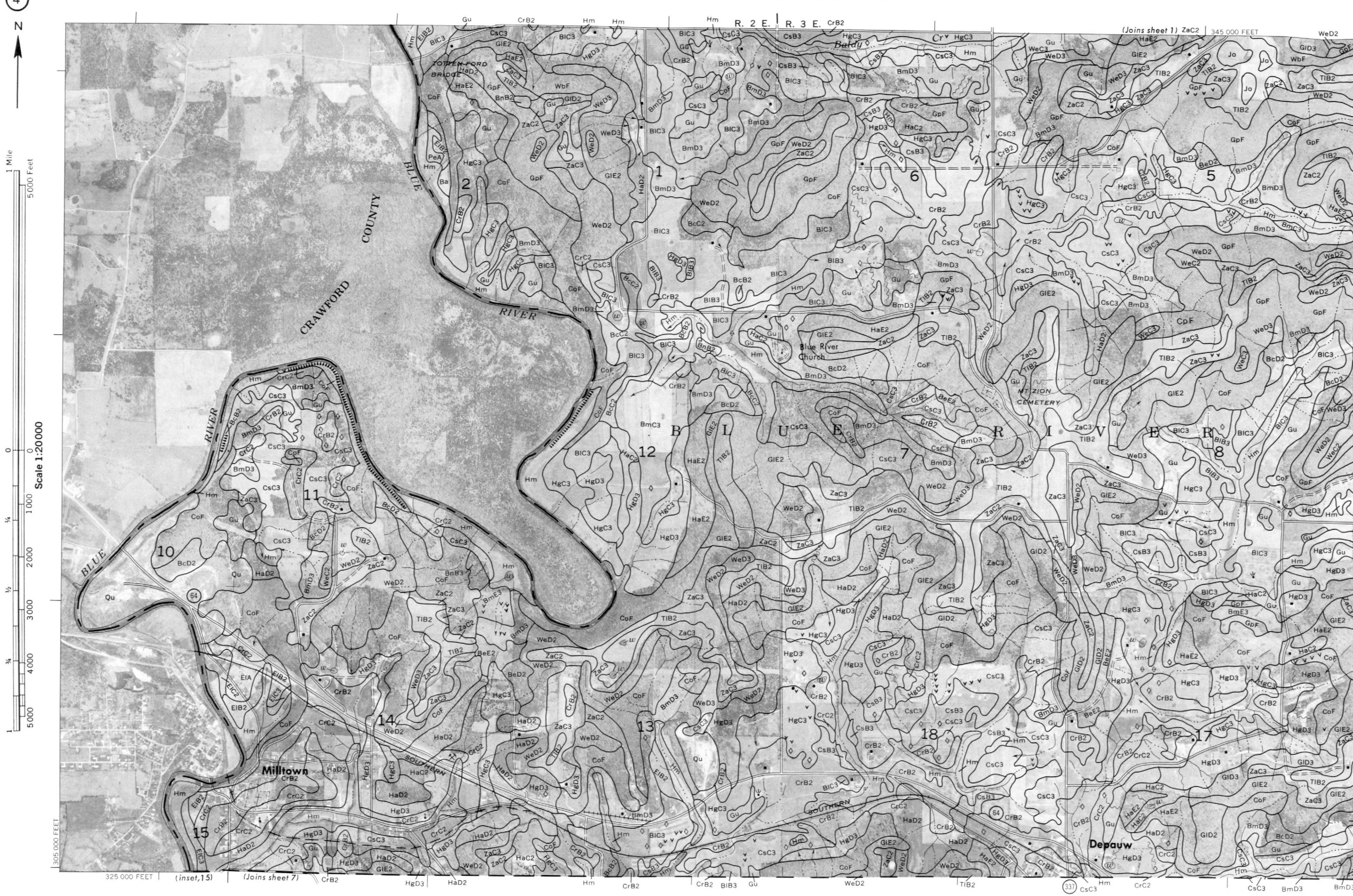

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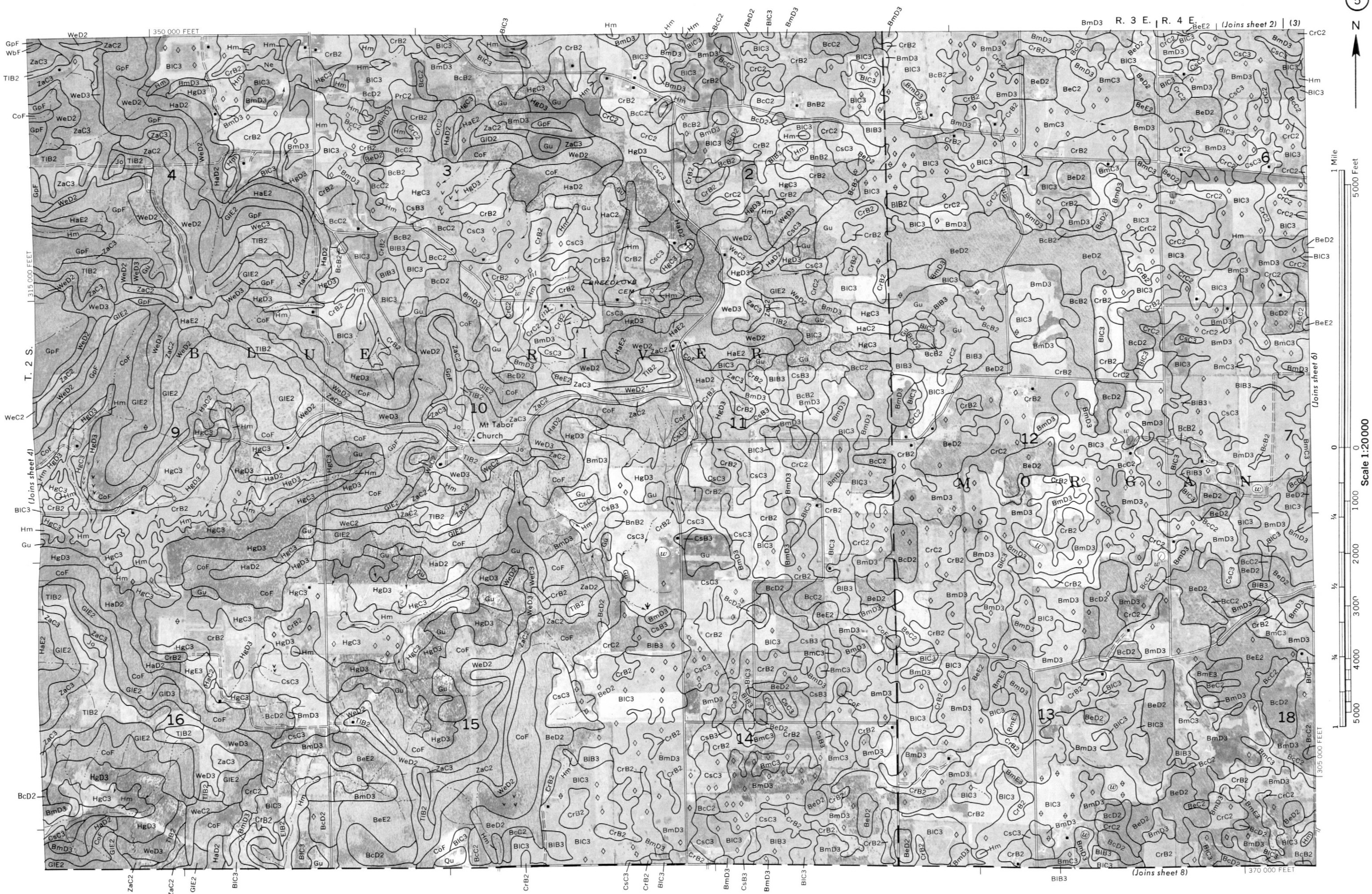
HARRISON COUNTY, INDIANA NO. 4



HARRISON COUNTY, INDIANA NO. 5

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
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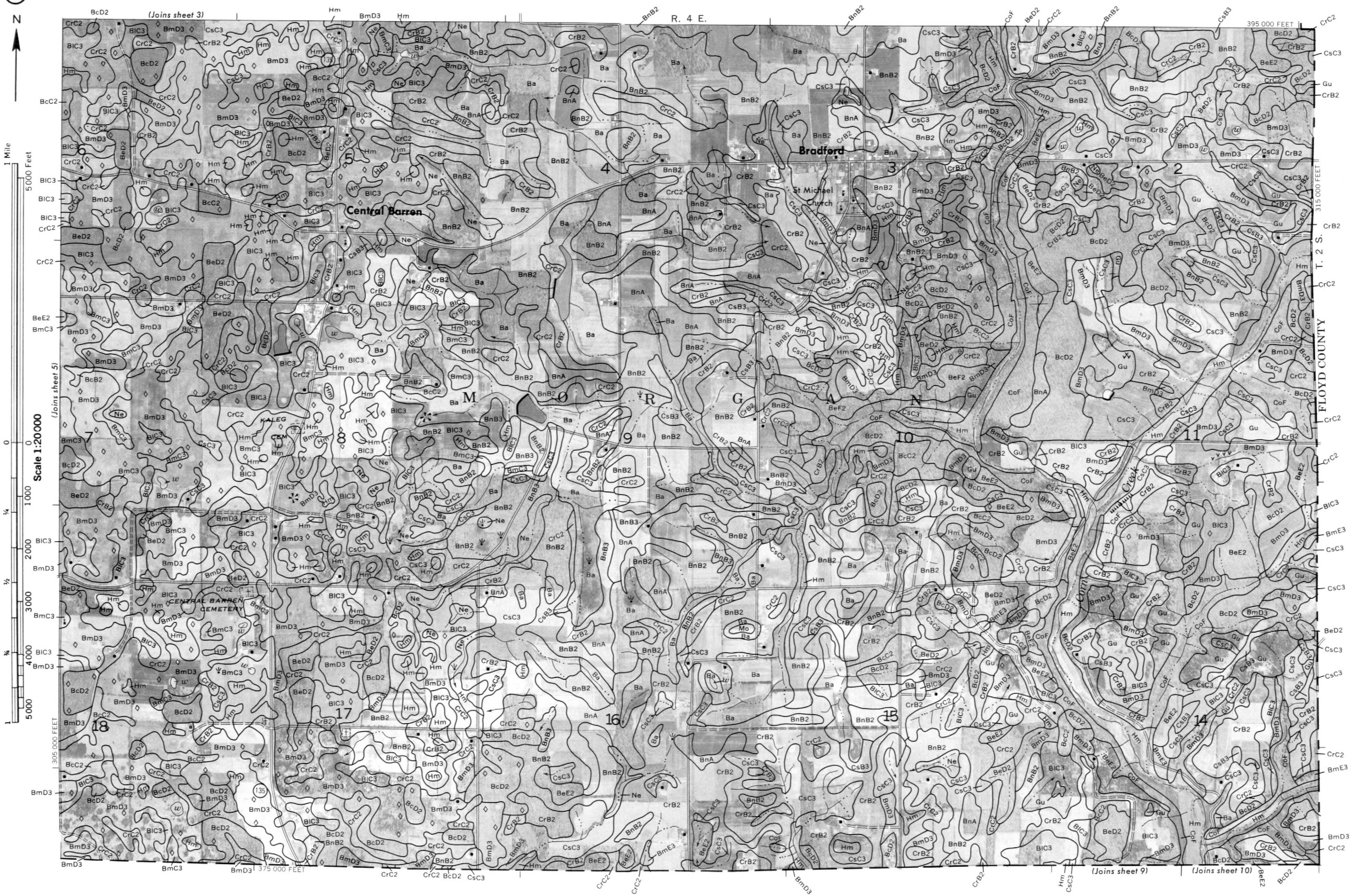
HARRISON COUNTY, INDIANA — SHEET NUMBER 6



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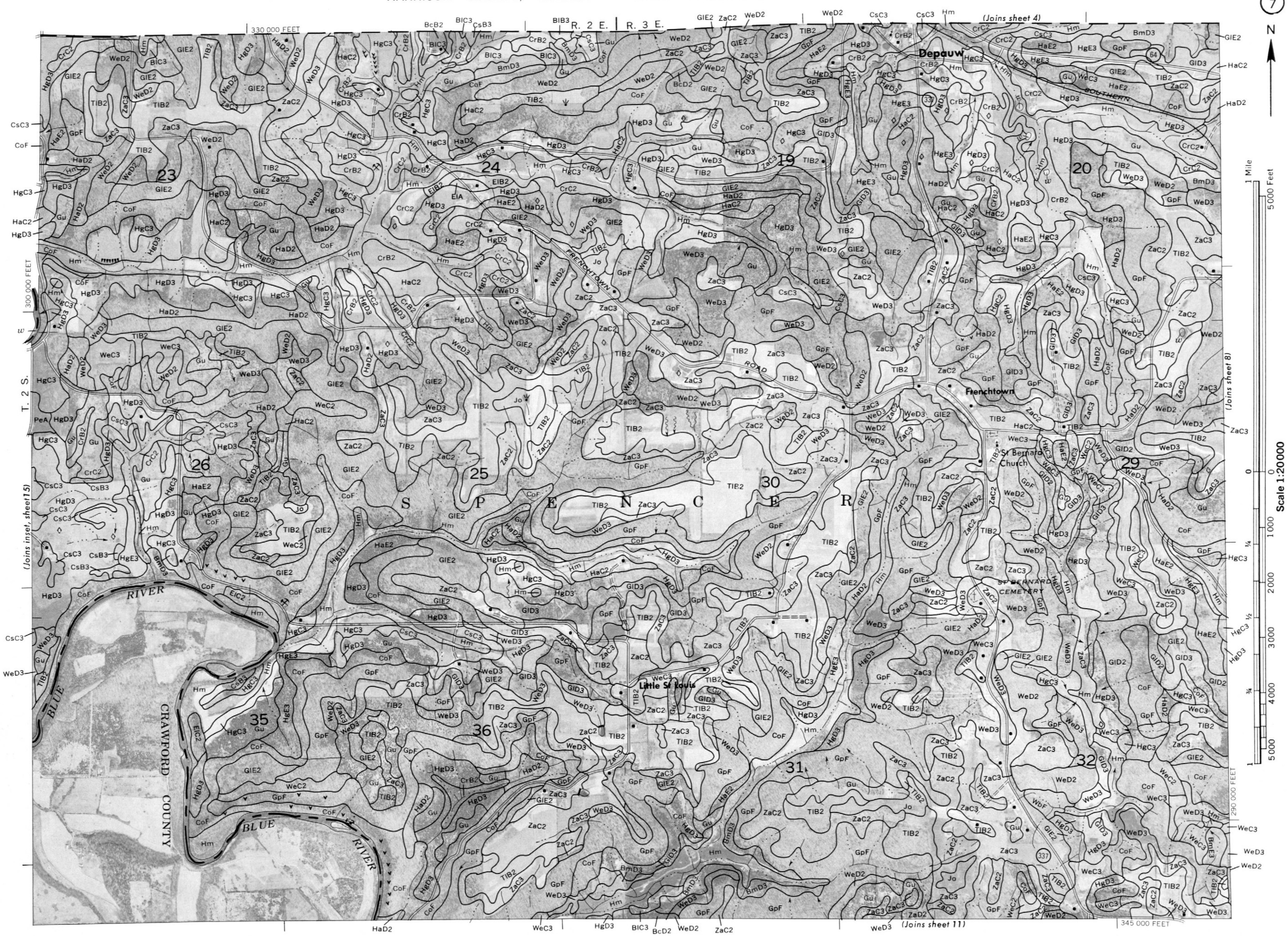
HARRISON COUNTY, INDIANA — SHEET NUMBER 7



HARRISON COUNTY, INDIANA NO. 7

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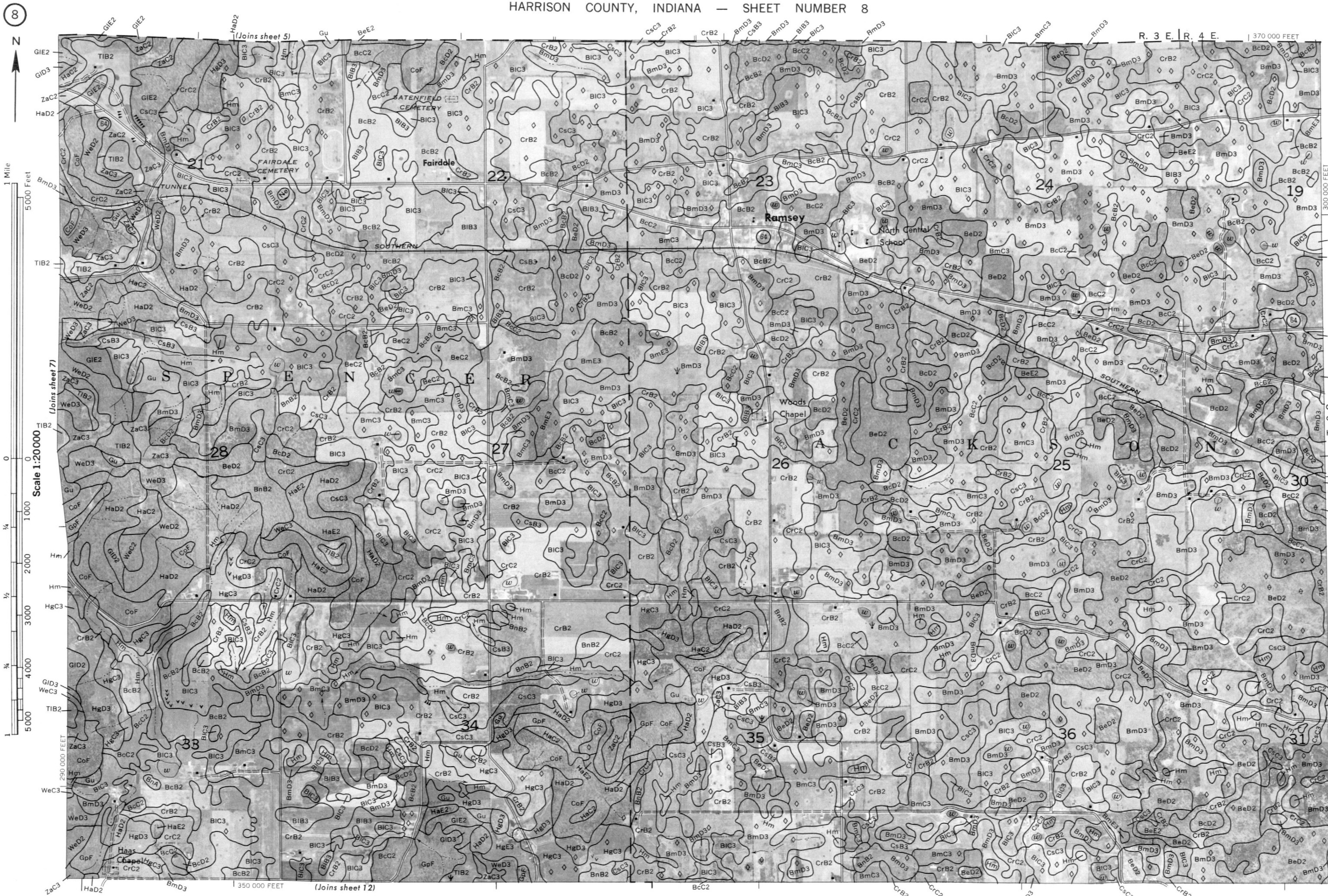

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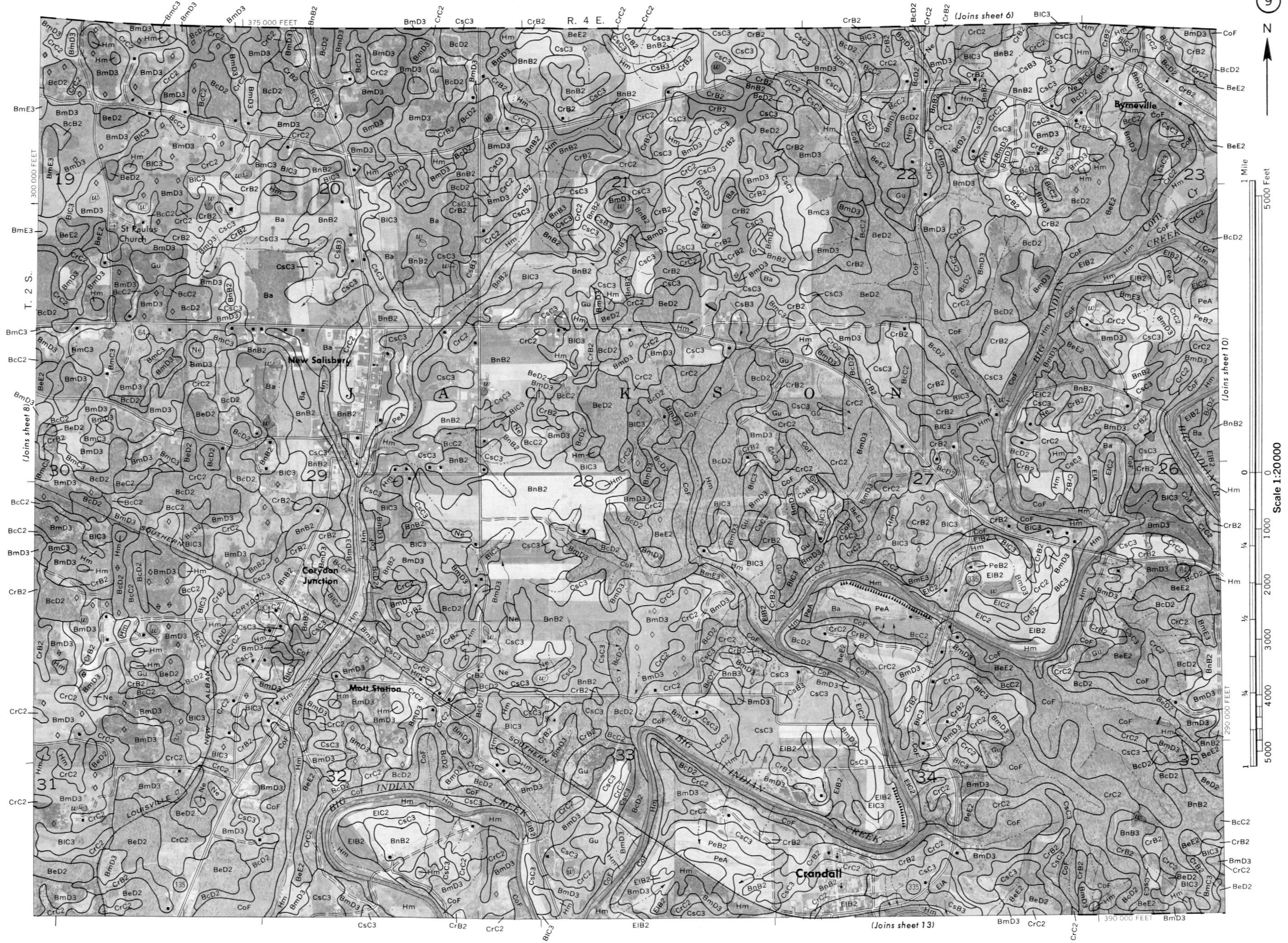
HARRISON COUNTY, INDIANA — SHEET NUMBER 9



HARRISON COUNTY, INDIANA NO. 9

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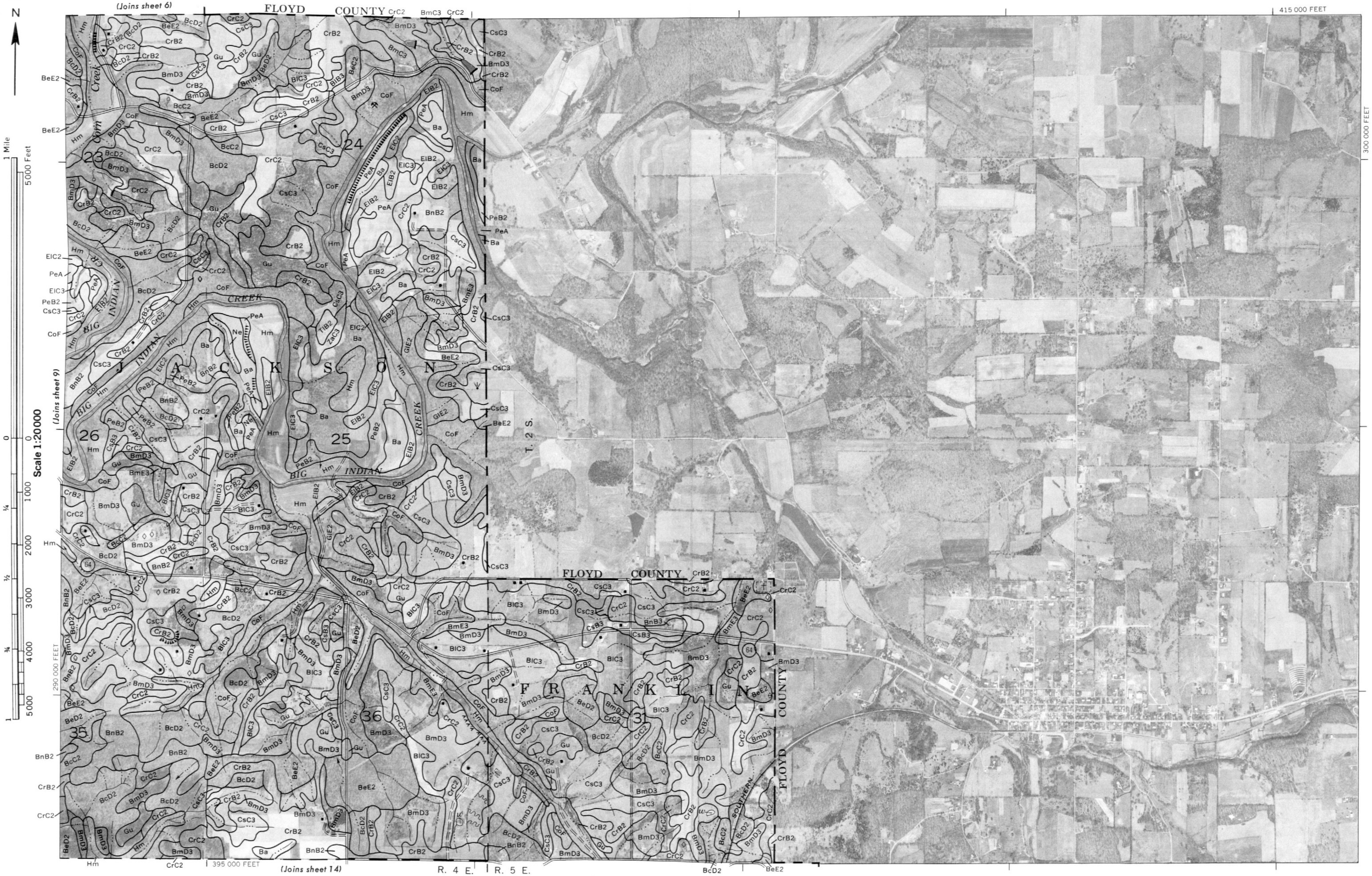
HARRISON COUNTY, INDIANA — SHEET NUMBER 10



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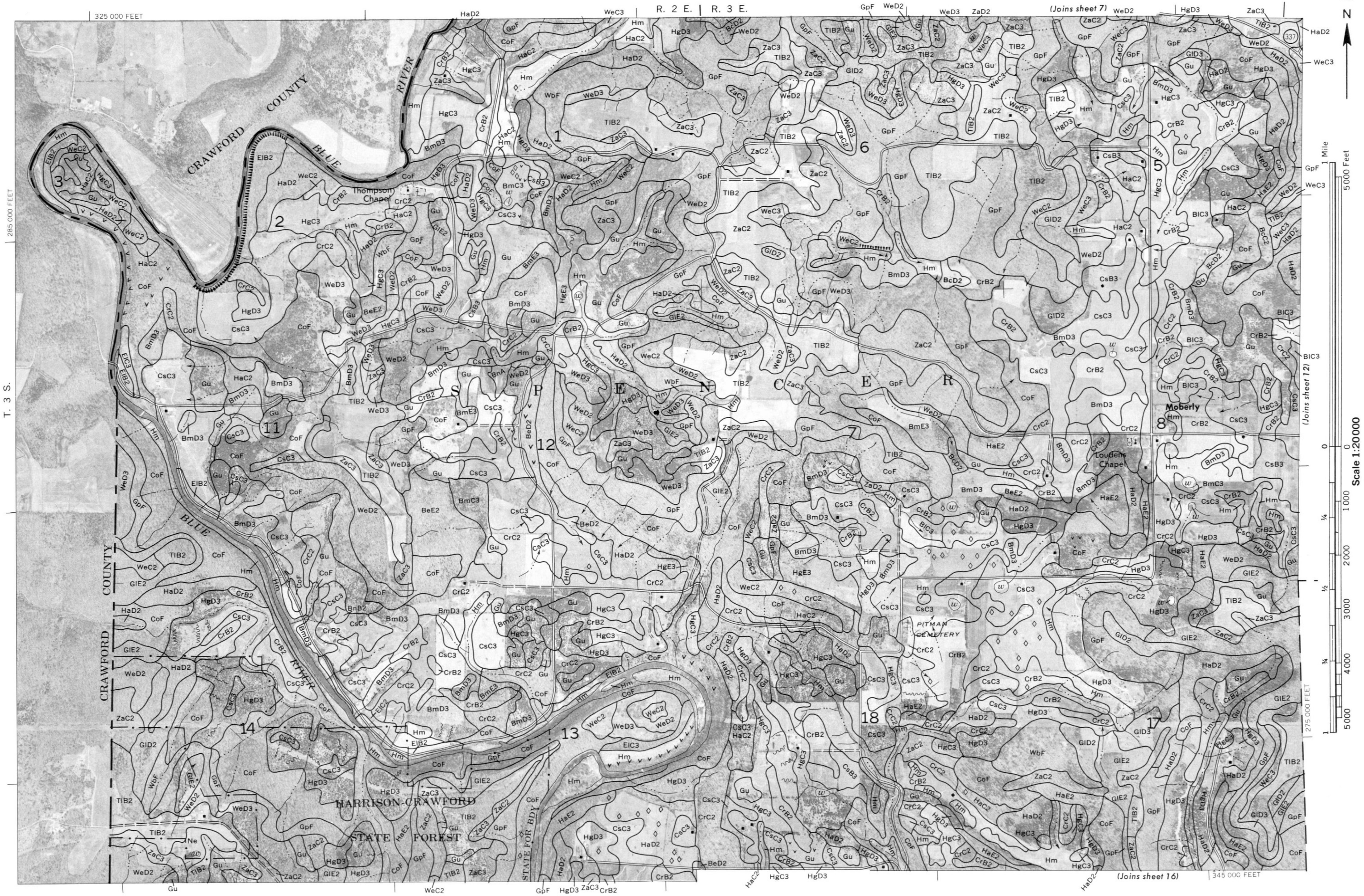

HARRISON COUNTY, INDIANA NO. 11
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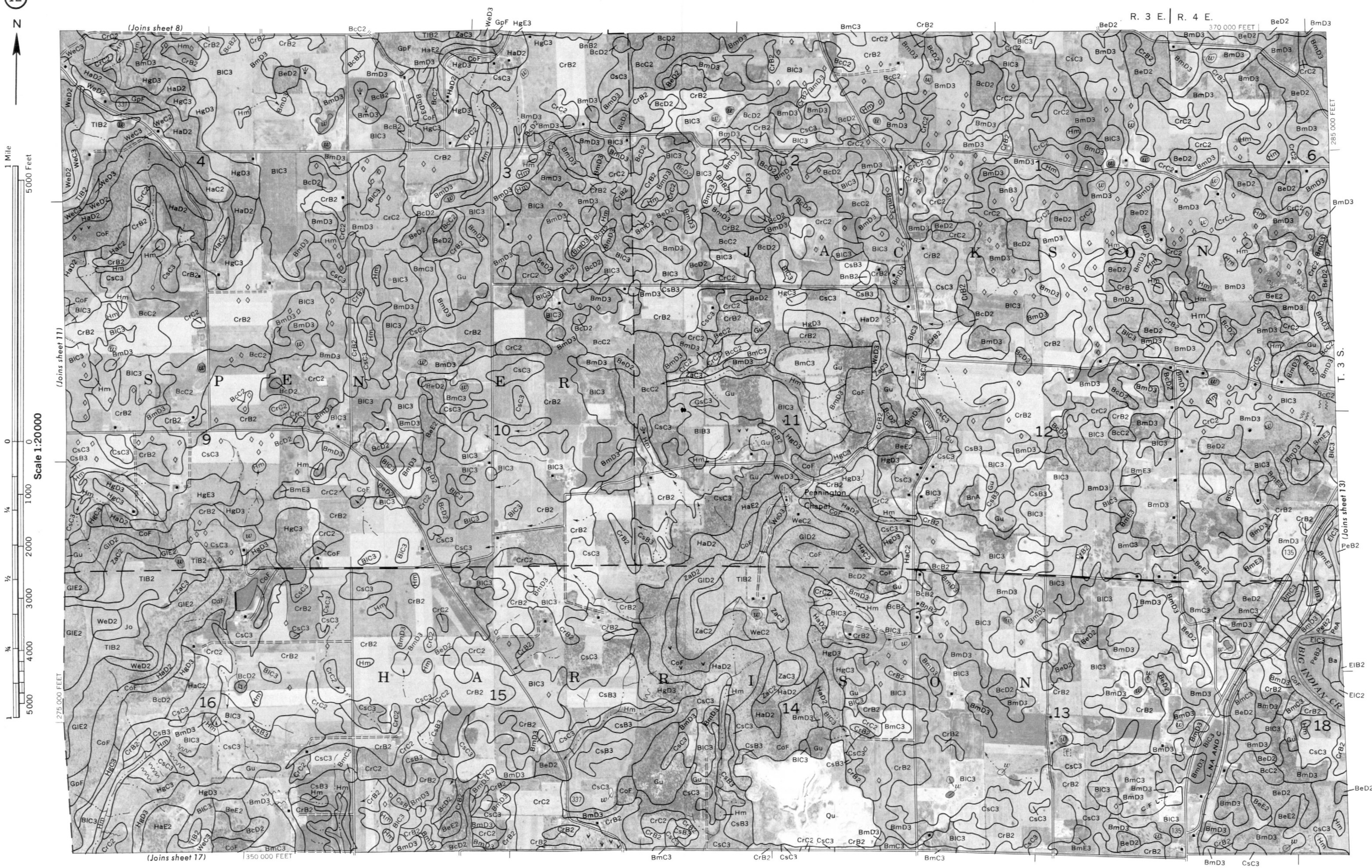
HARRISON COUNTY, INDIANA — SHEET NUMBER 12



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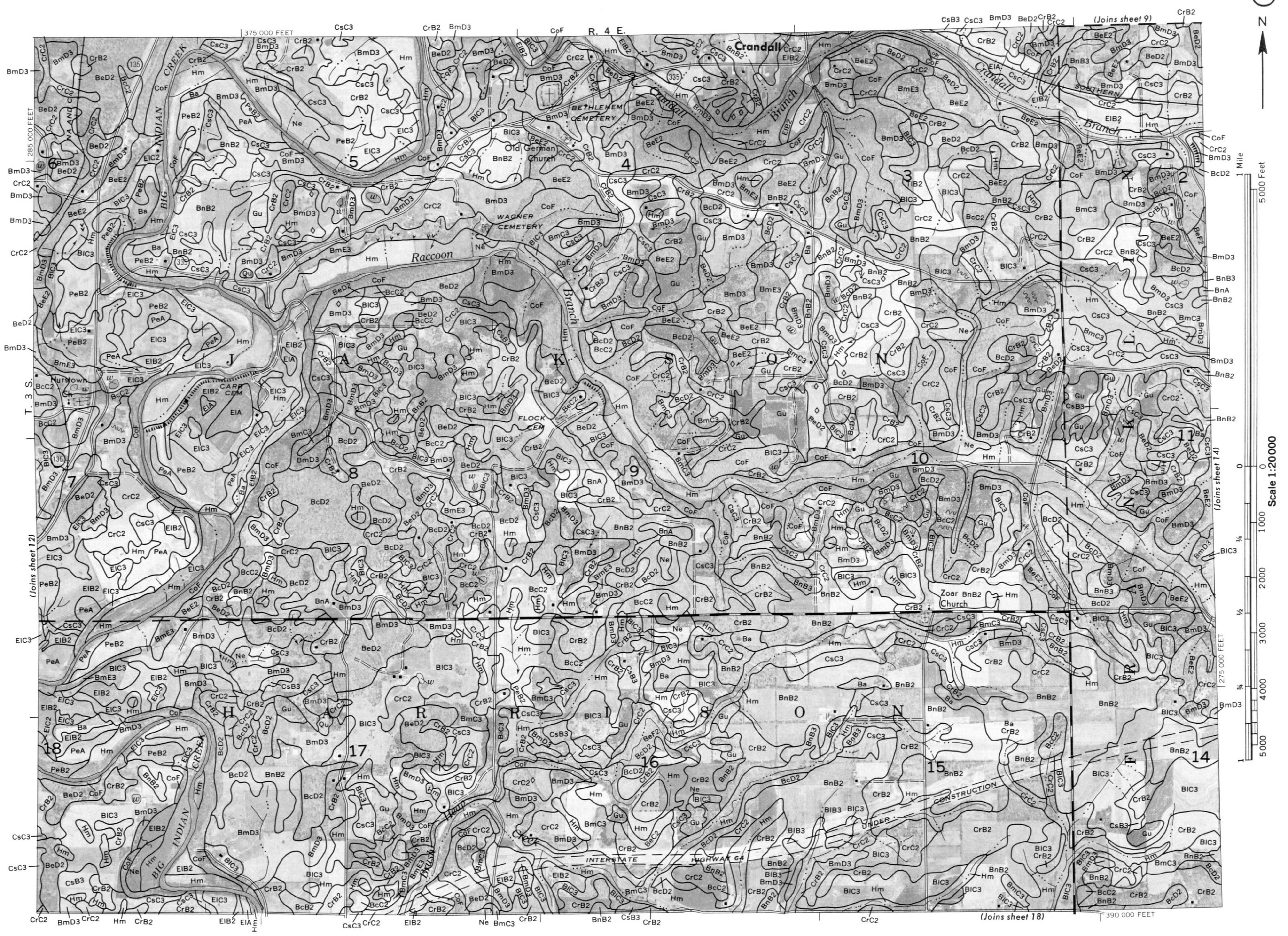

HARRISON COUNTY, INDIANA NO. 13

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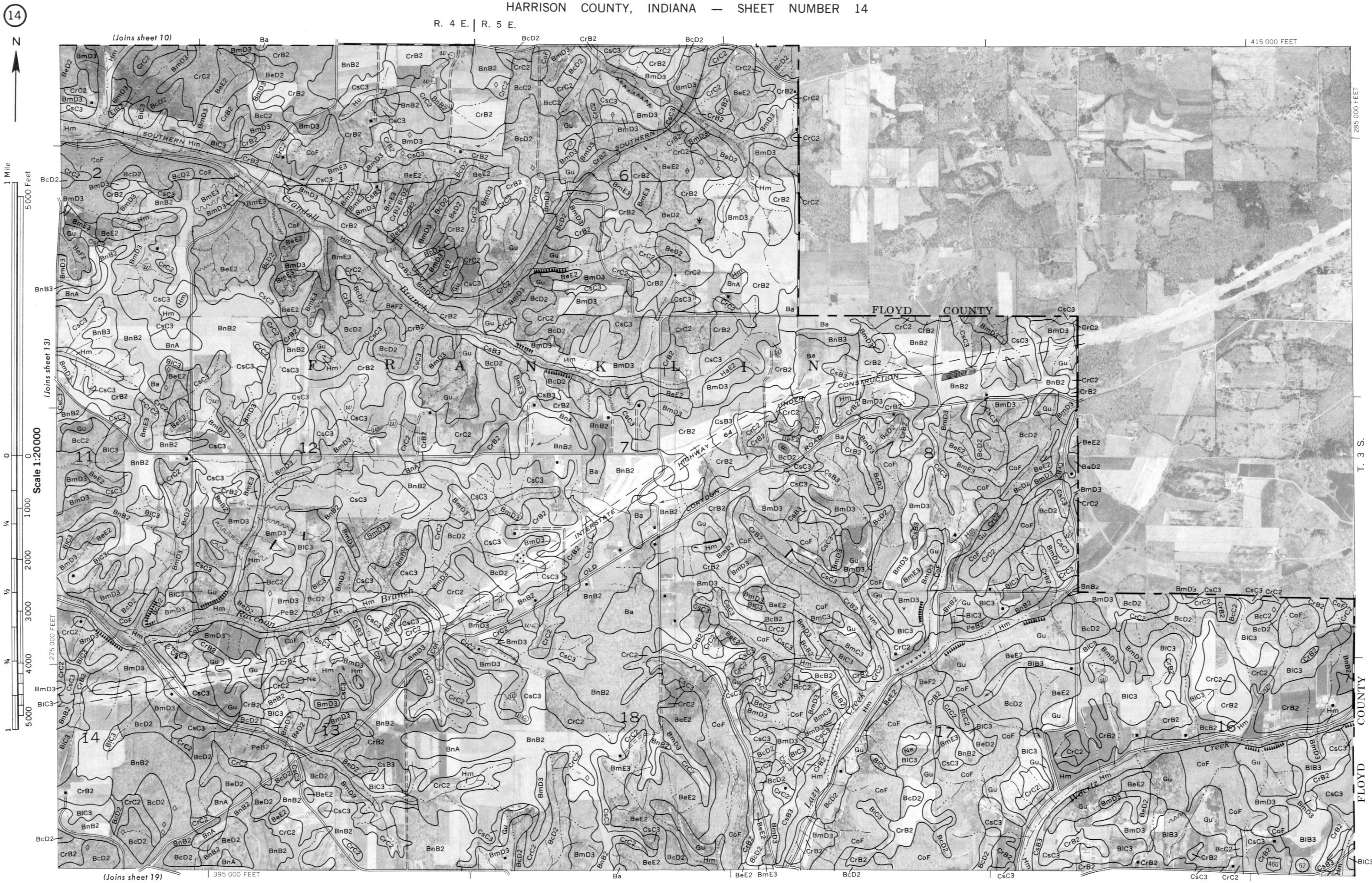
HARRISON COUNTY, INDIANA — SHEET NUMBER 14



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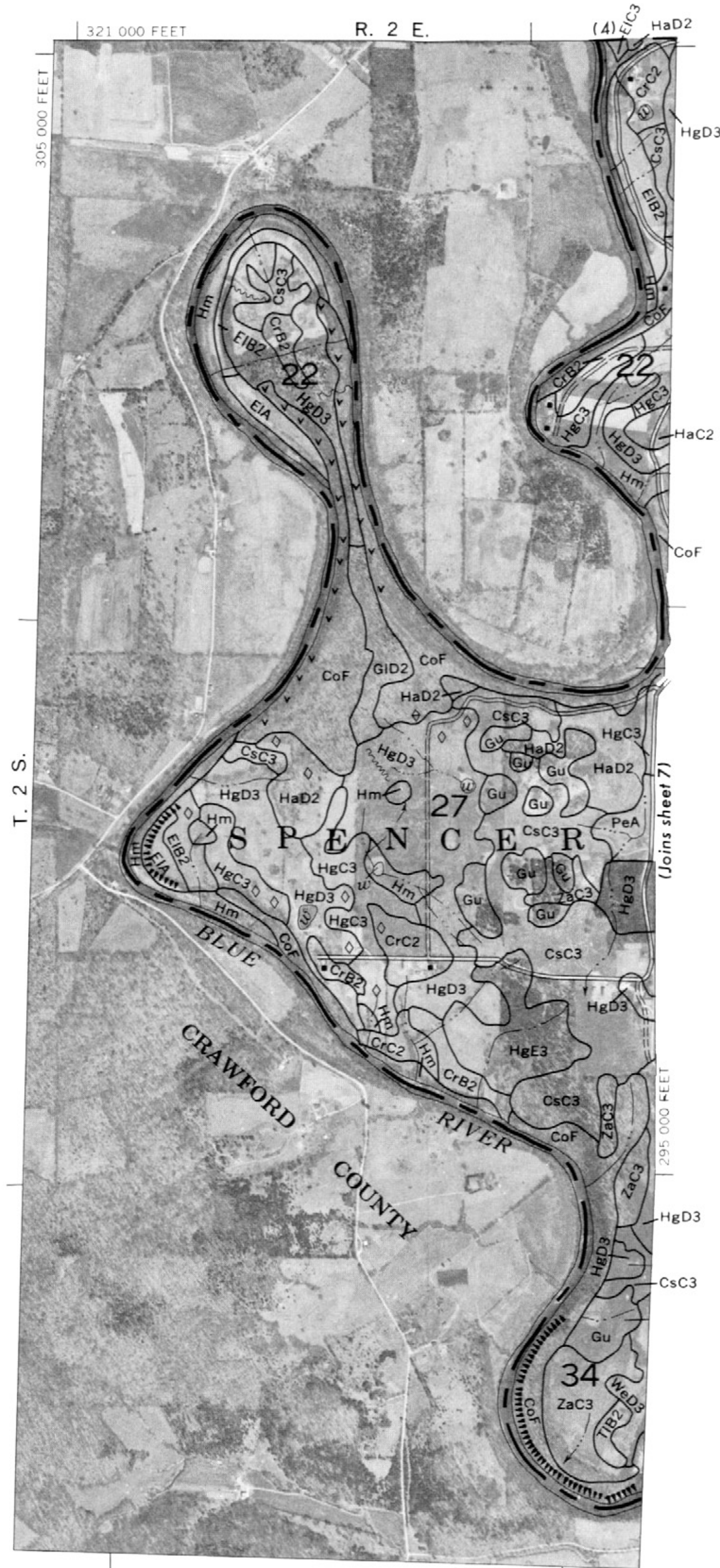
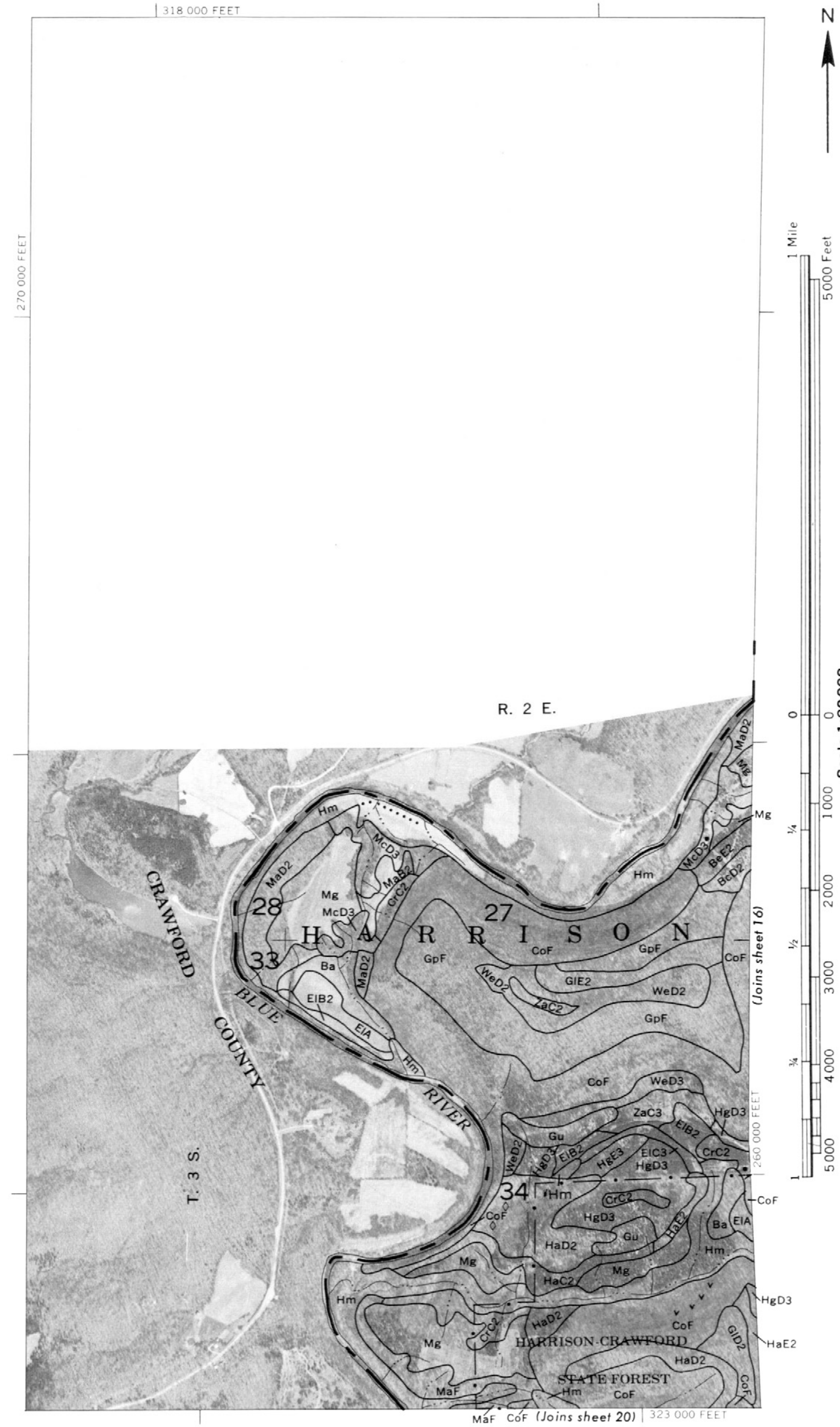


4 000 AND 5 000-FOOT GRID TICKS



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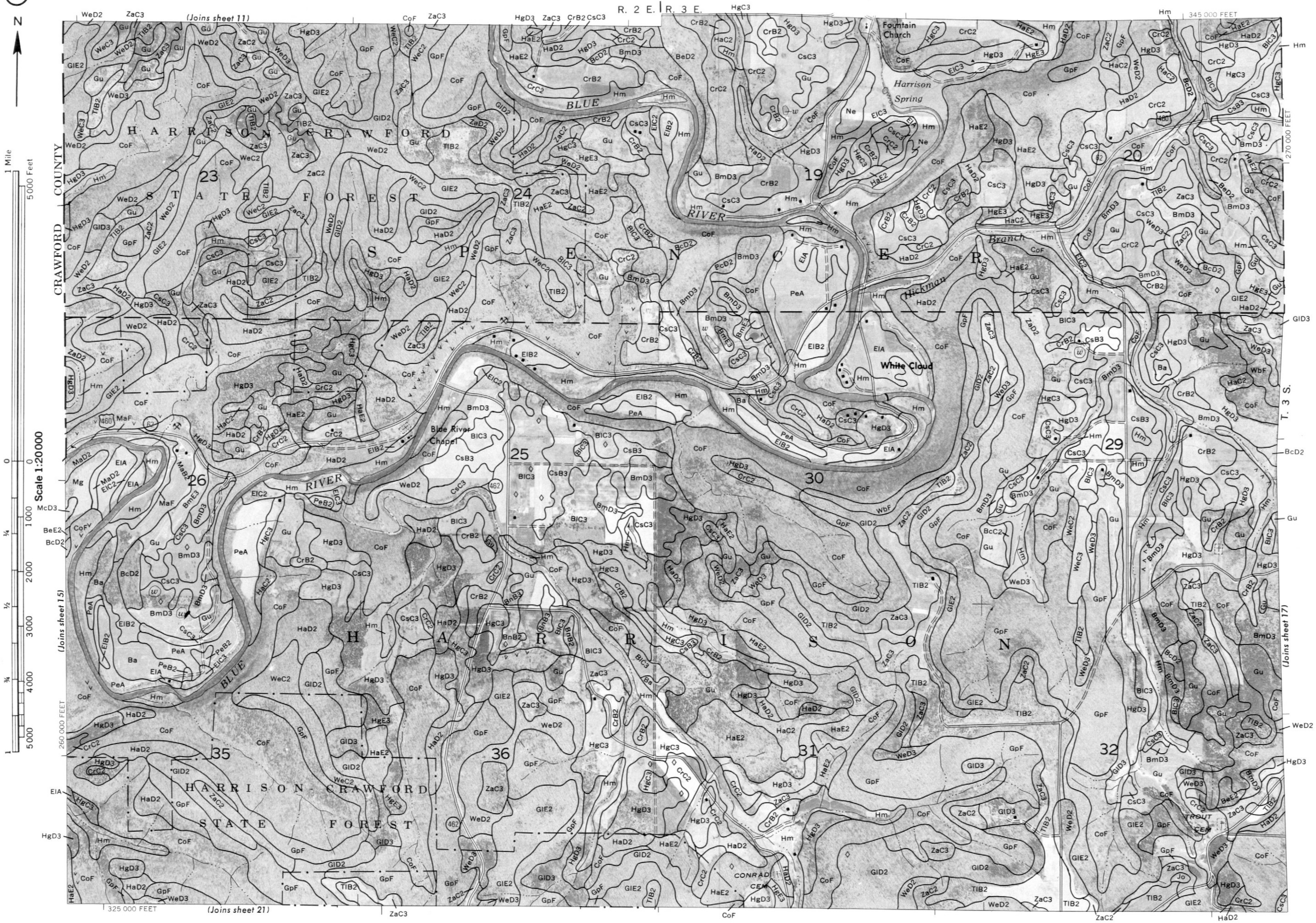

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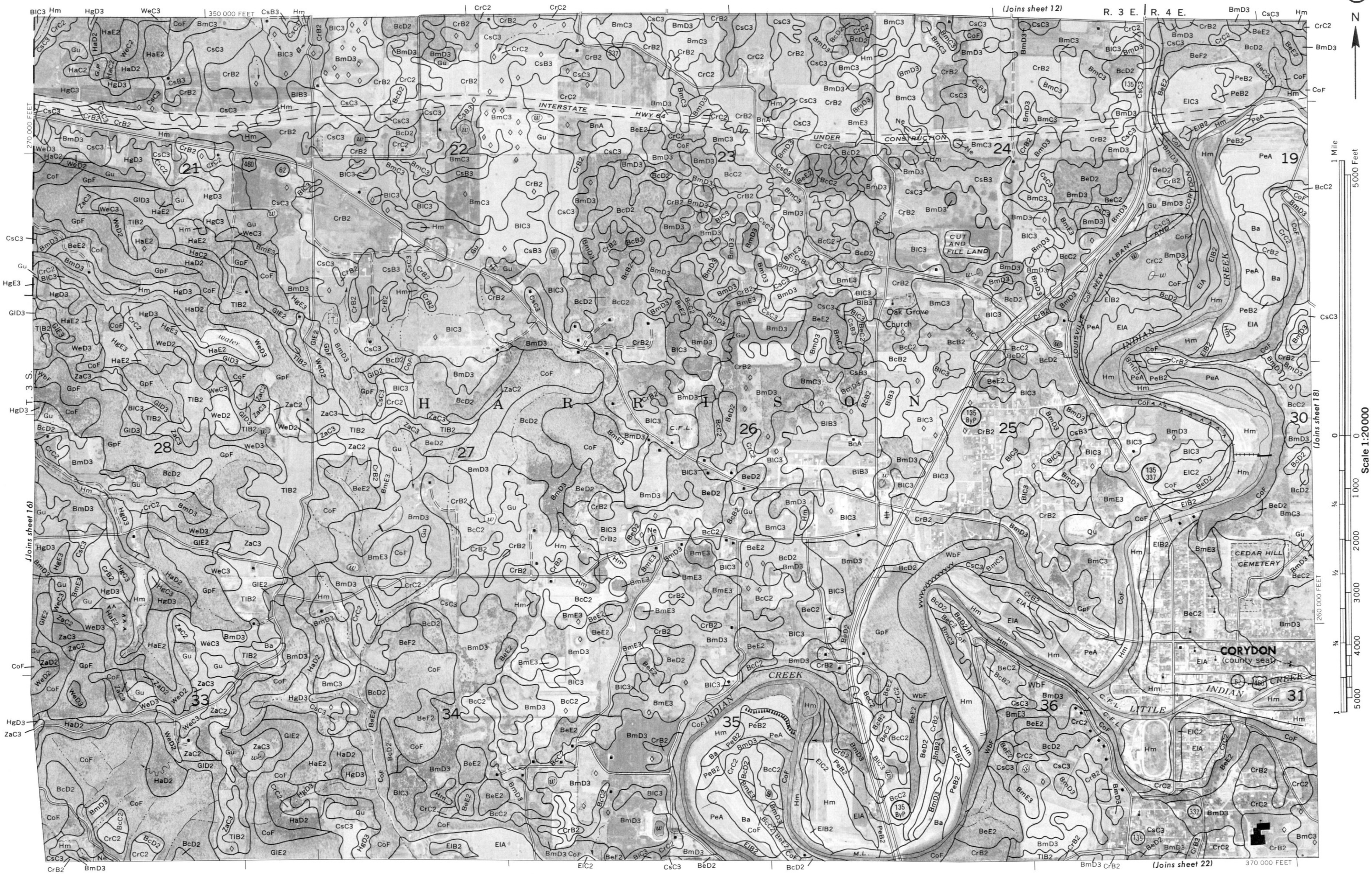

HARRISON COUNTY, INDIANA NO. 17
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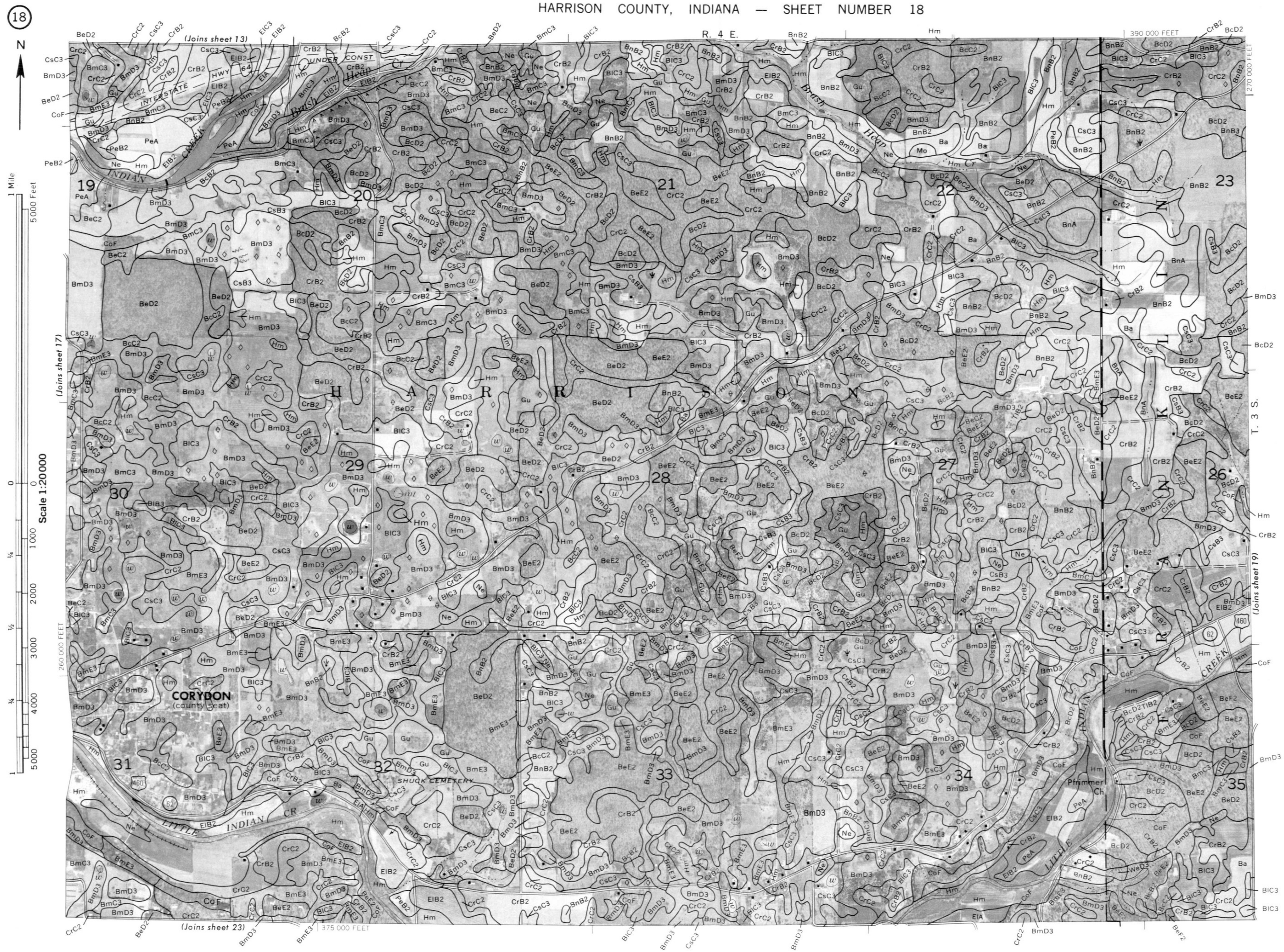

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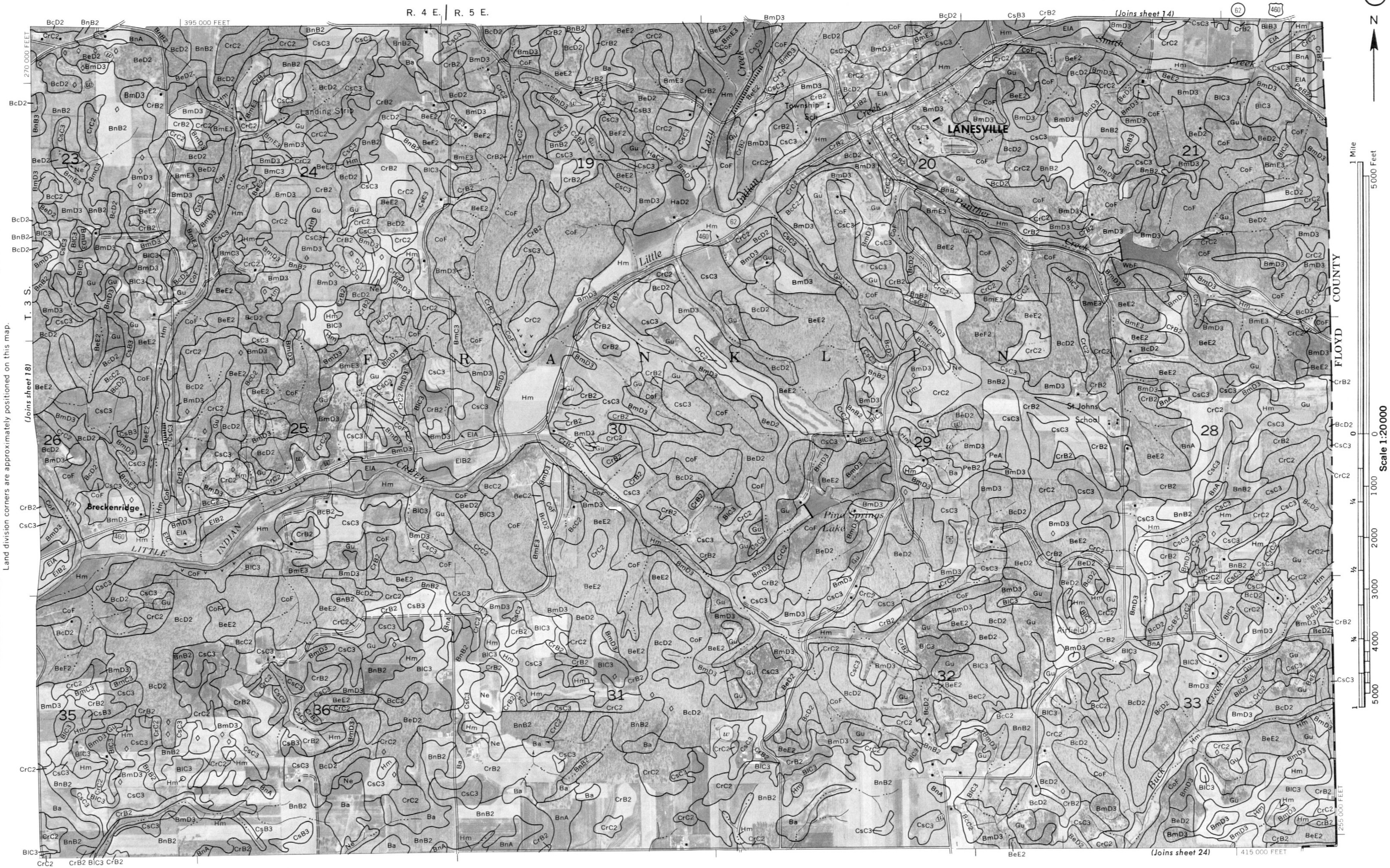

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

(20)

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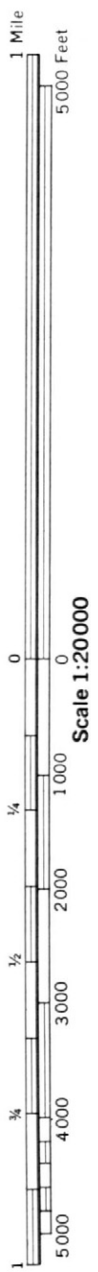

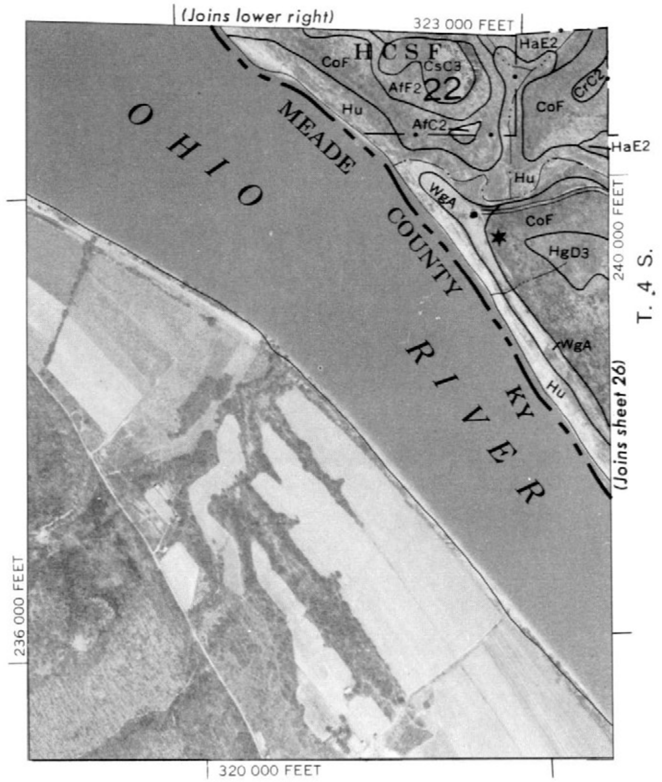

3 000 AND 4 000-GRID TICKS

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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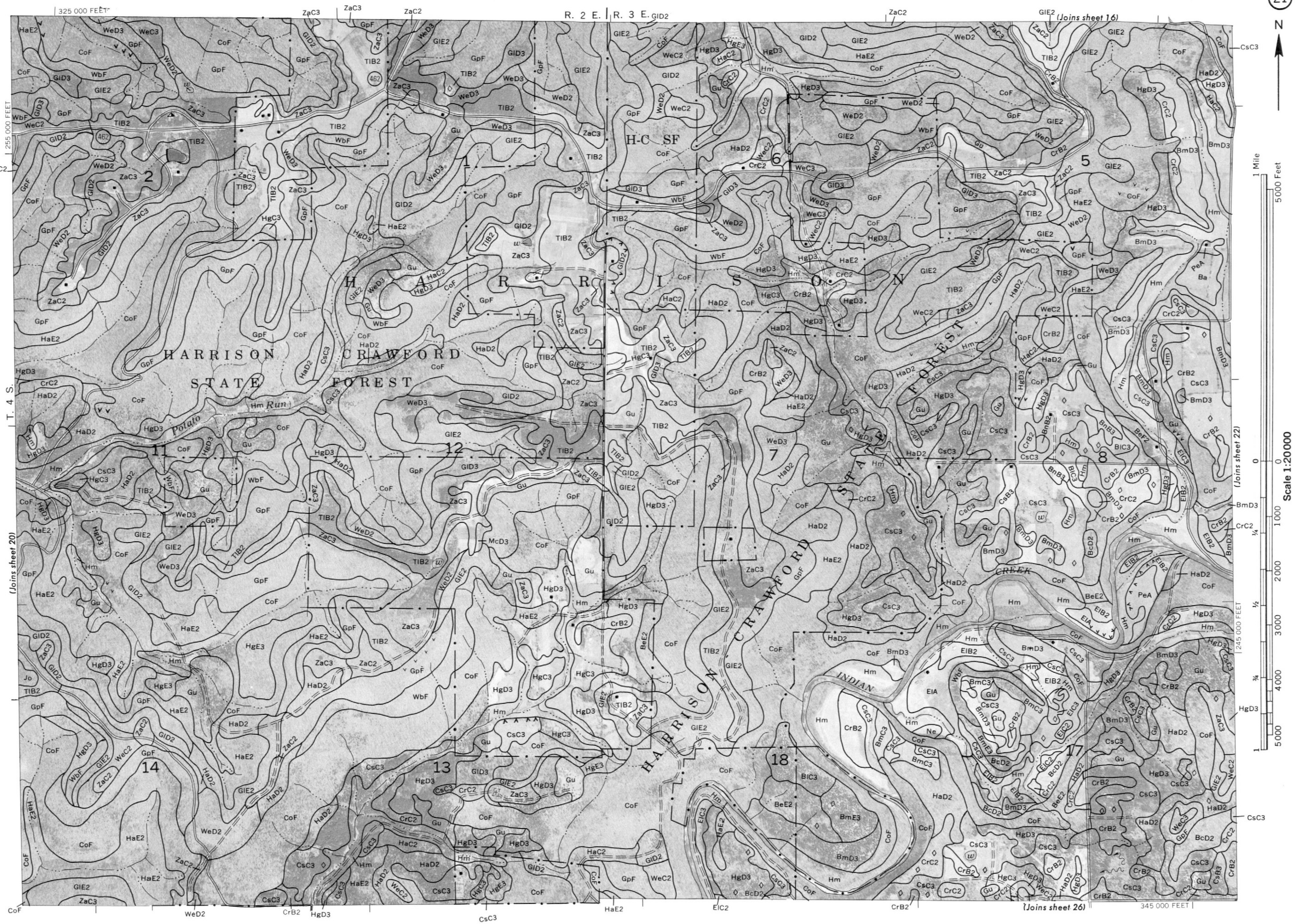

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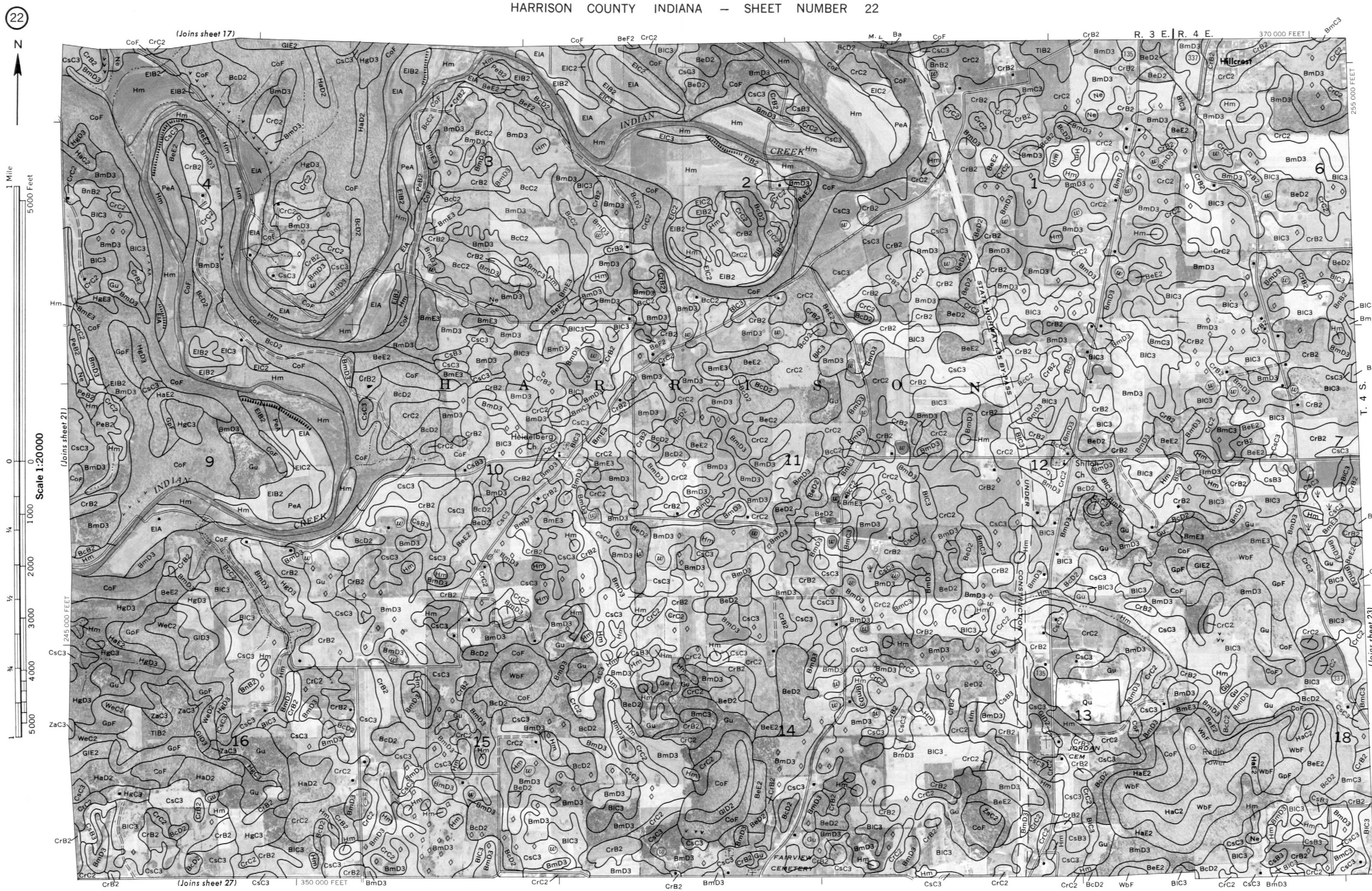
Land division corners are approximately positioned on this map.



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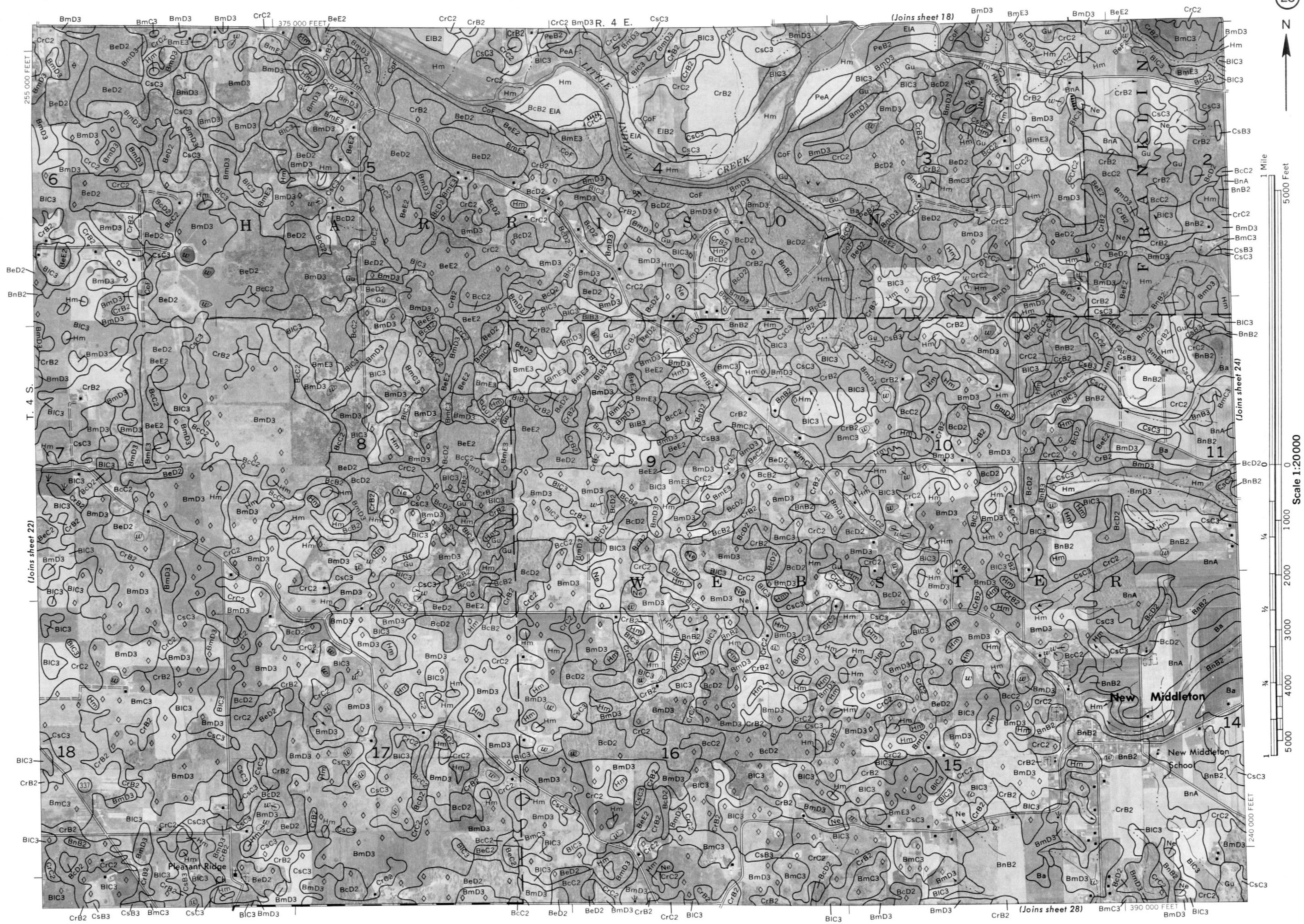


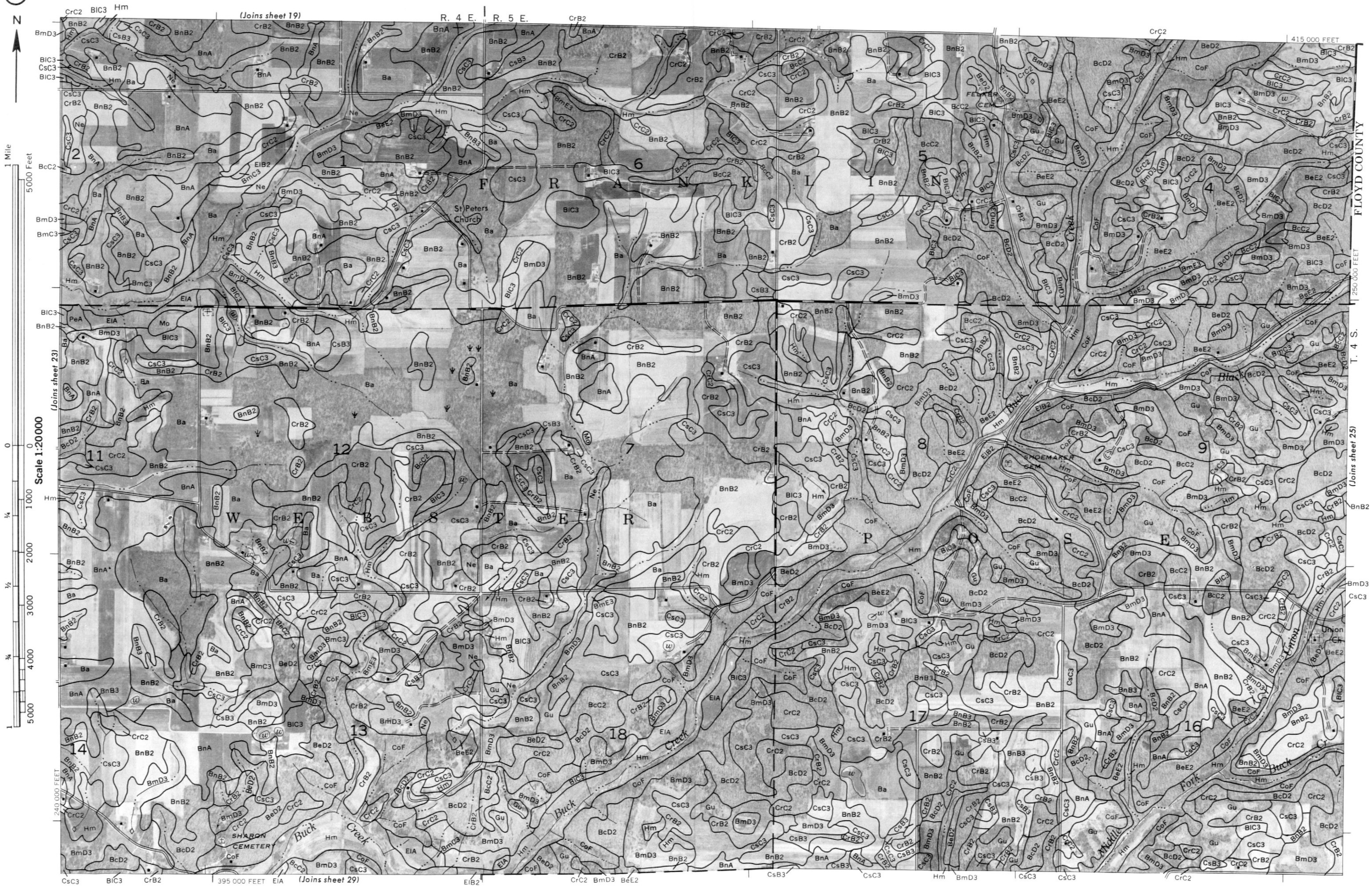
HARRISON COUNTY, INDIANA NO. 23

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 24



Land division corners are approximately positioned on this map.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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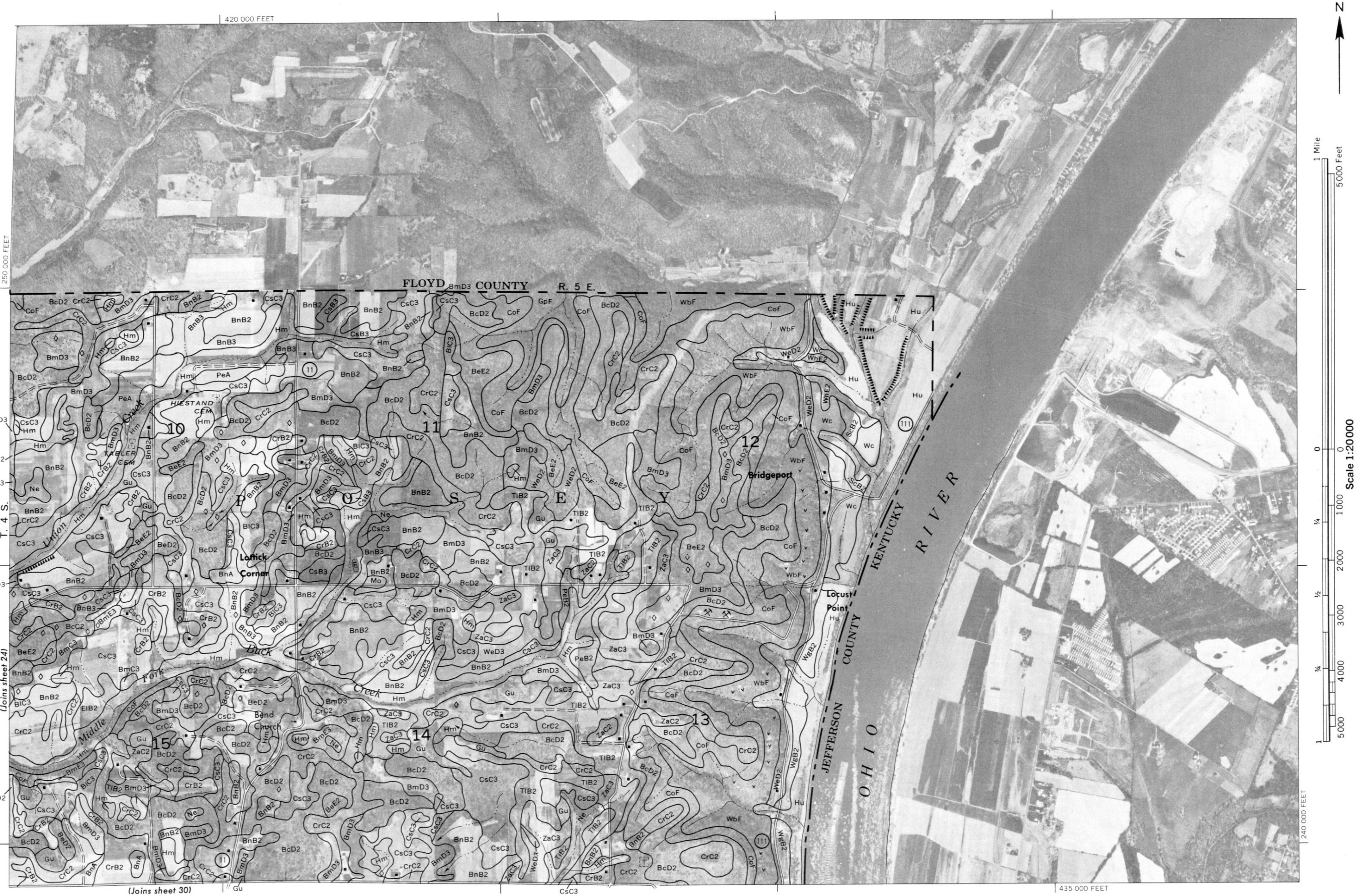
HARRISON COUNTY, INDIANA NO. 24



HARRISON COUNTY, INDIANA NO. 25

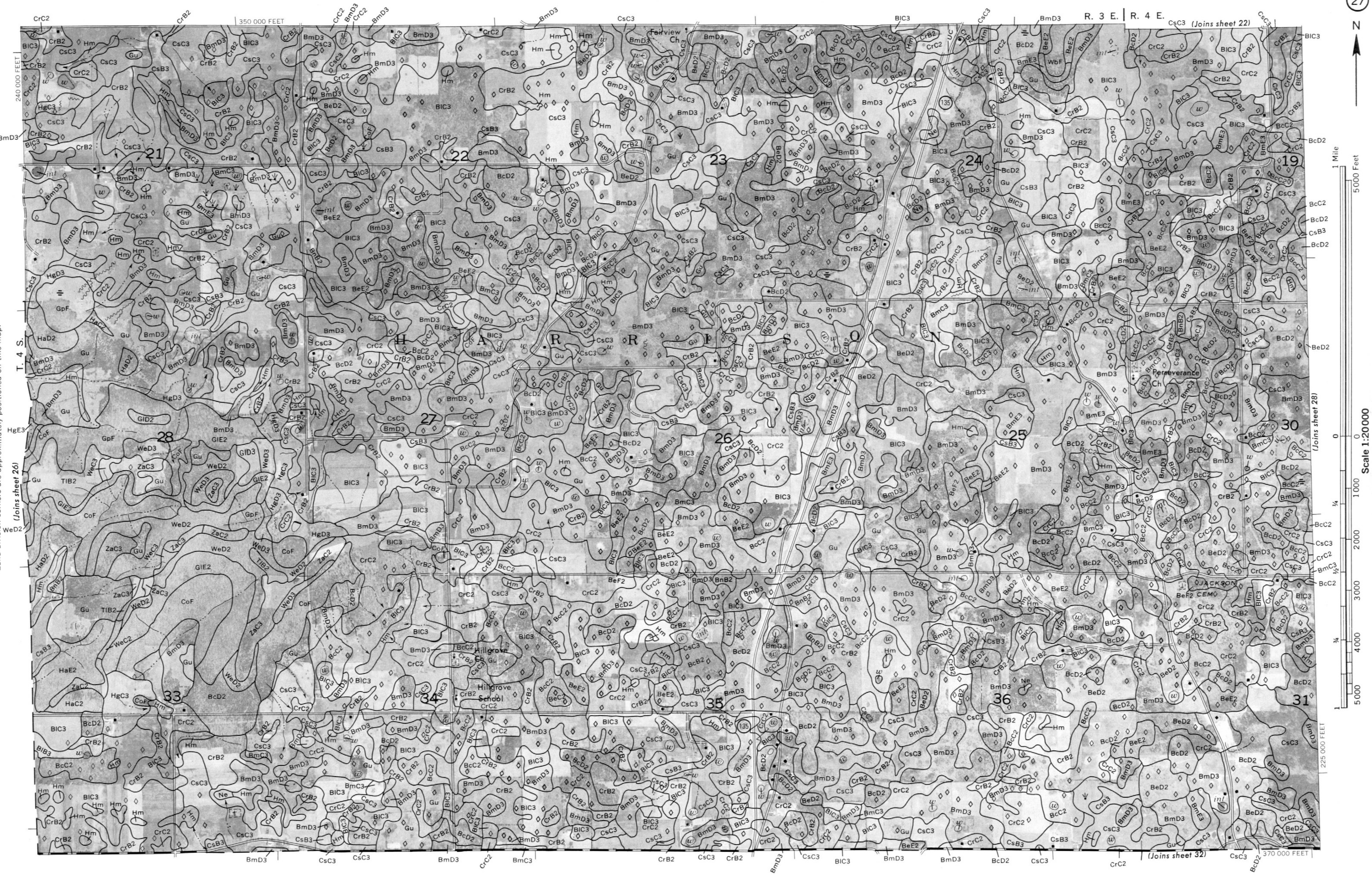
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 26

Land division corners are approximately positioned on this map.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

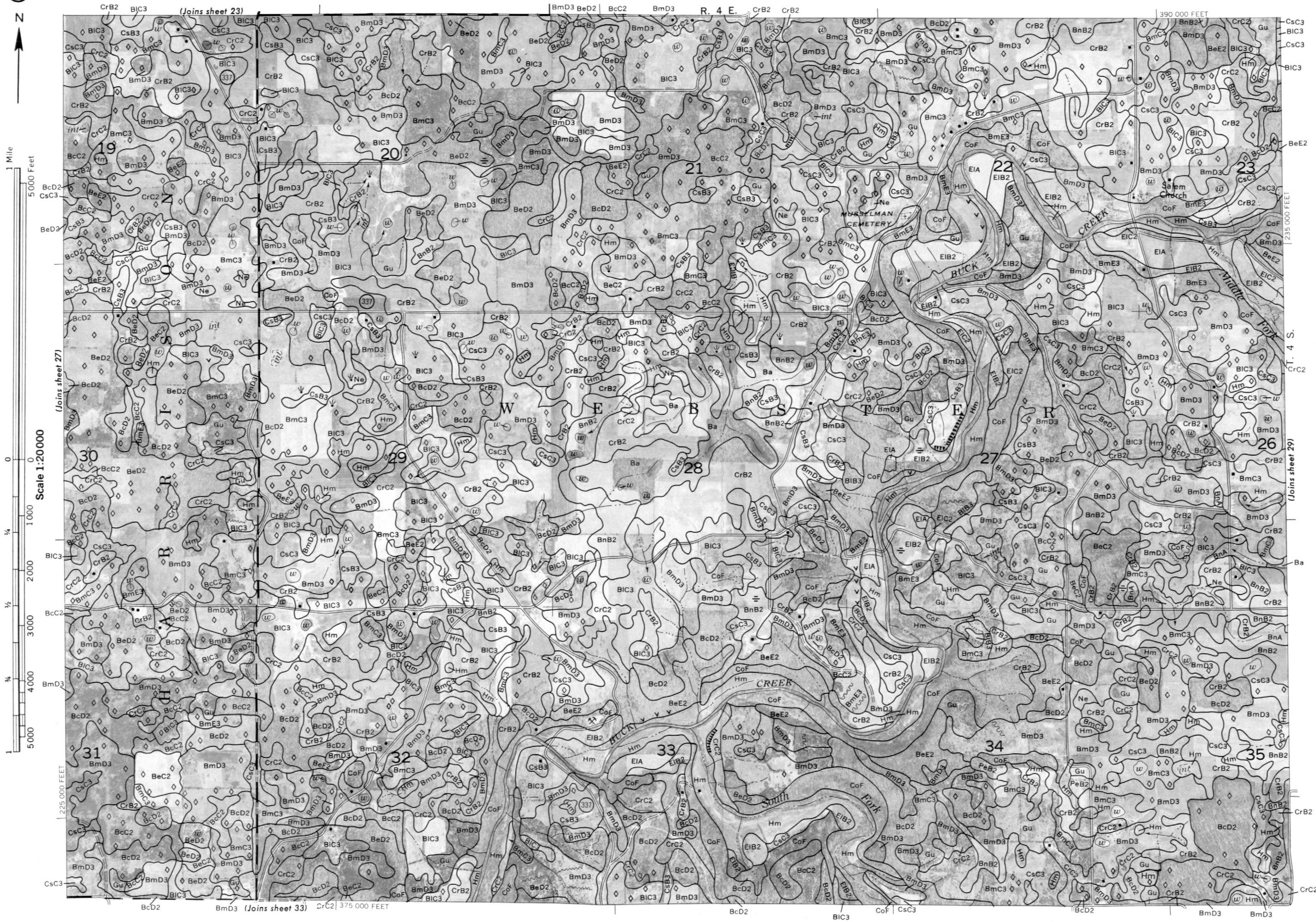
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.



HARRISON COUNTY, INDIANA NO. 27

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 28



Land division corners are approximately positioned on this map.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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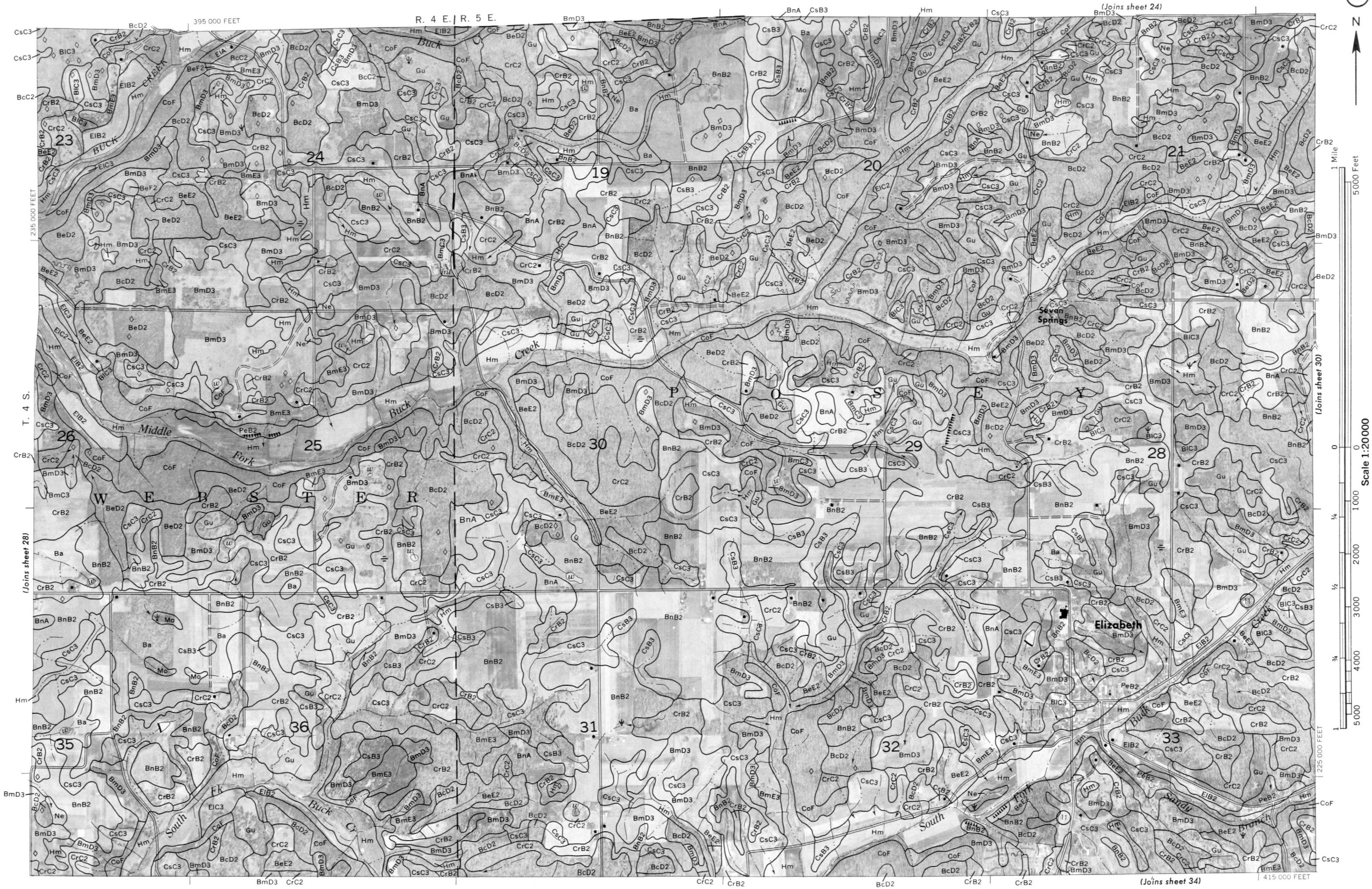


HARRISON COUNTY, INDIANA NO. 29

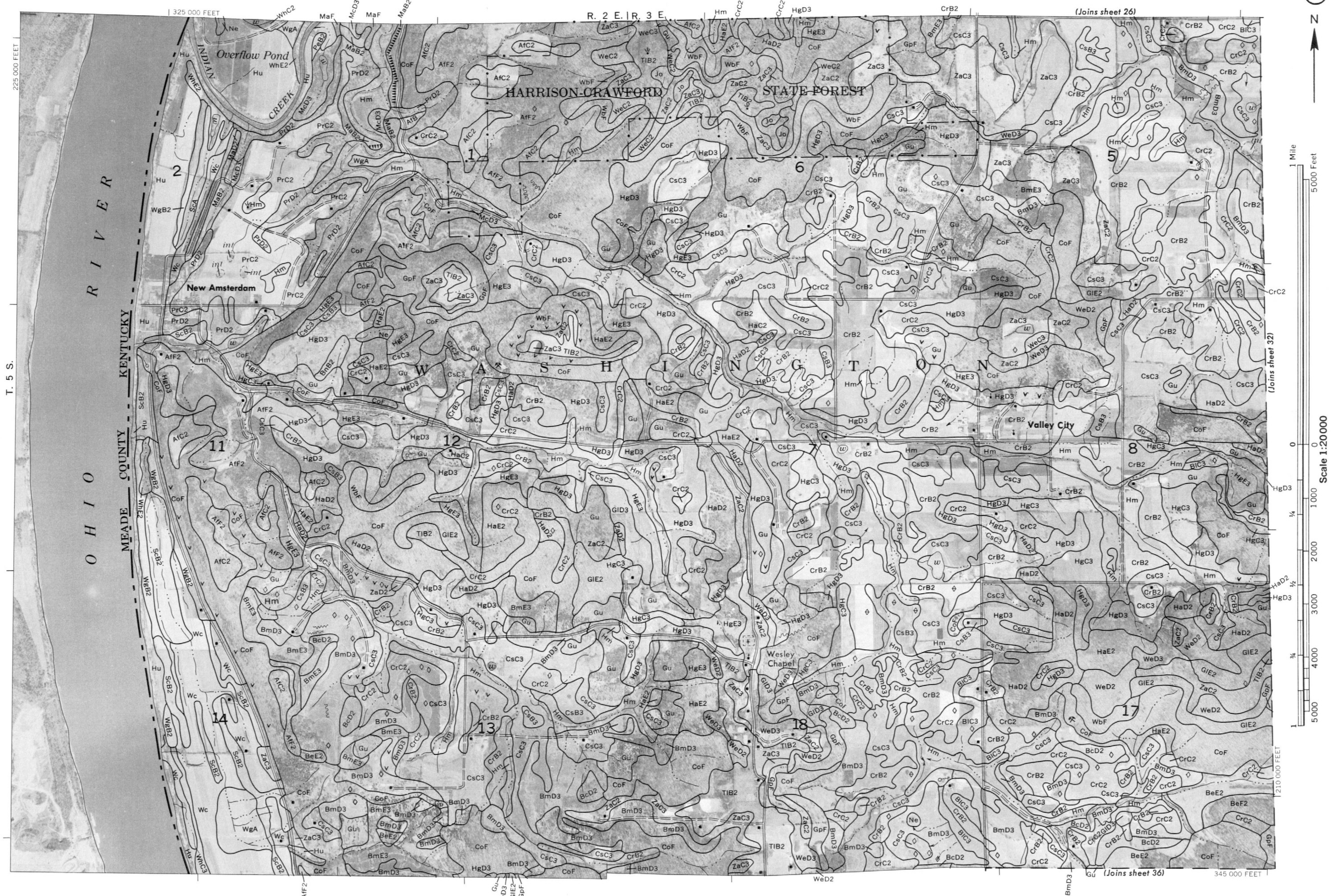
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.
Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 30

Land division corners are approximately positioned on this map.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

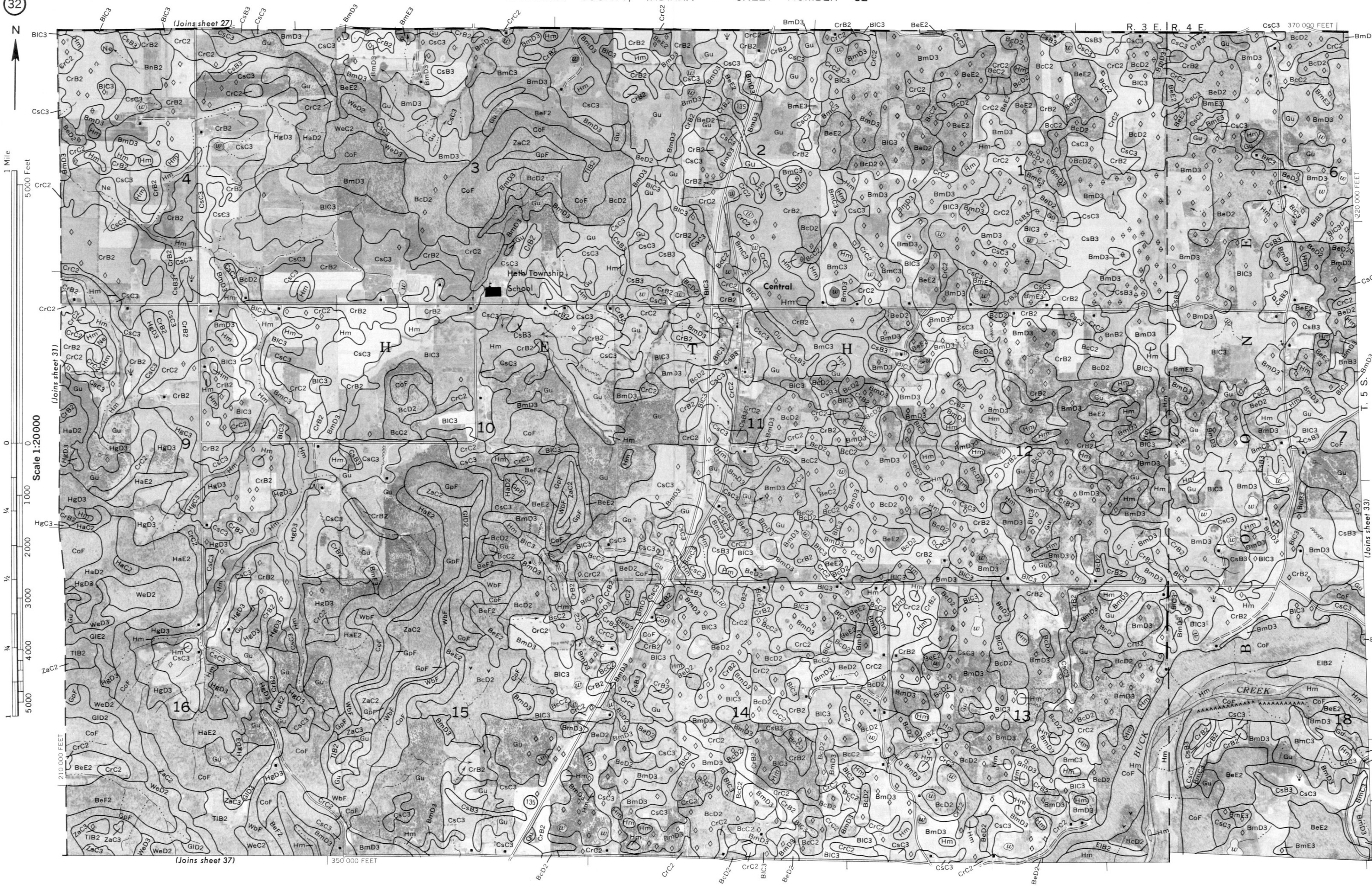


HARRISON COUNTY, INDIANA NO. 31

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.



Land division corners are approximately positioned on this map.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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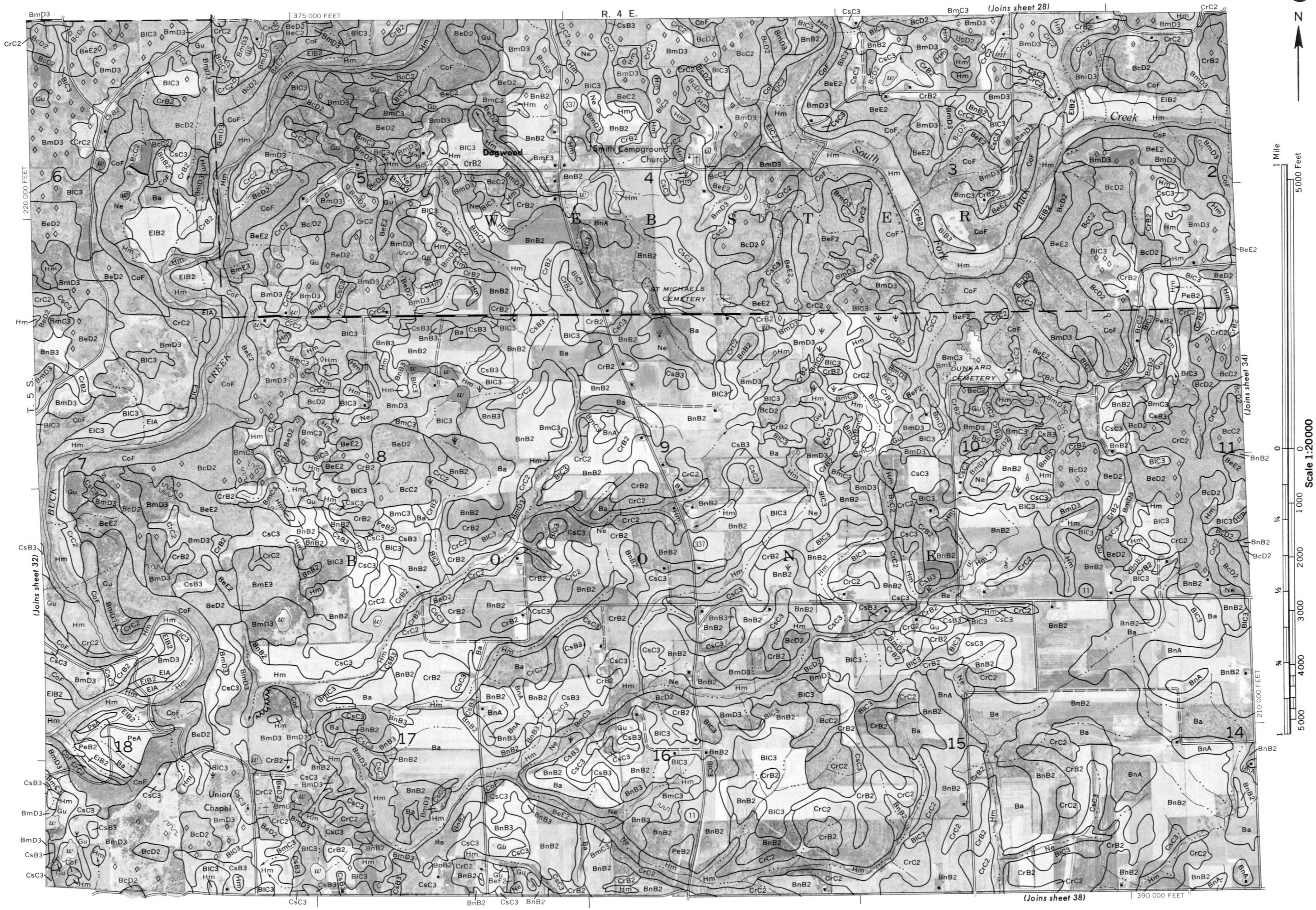


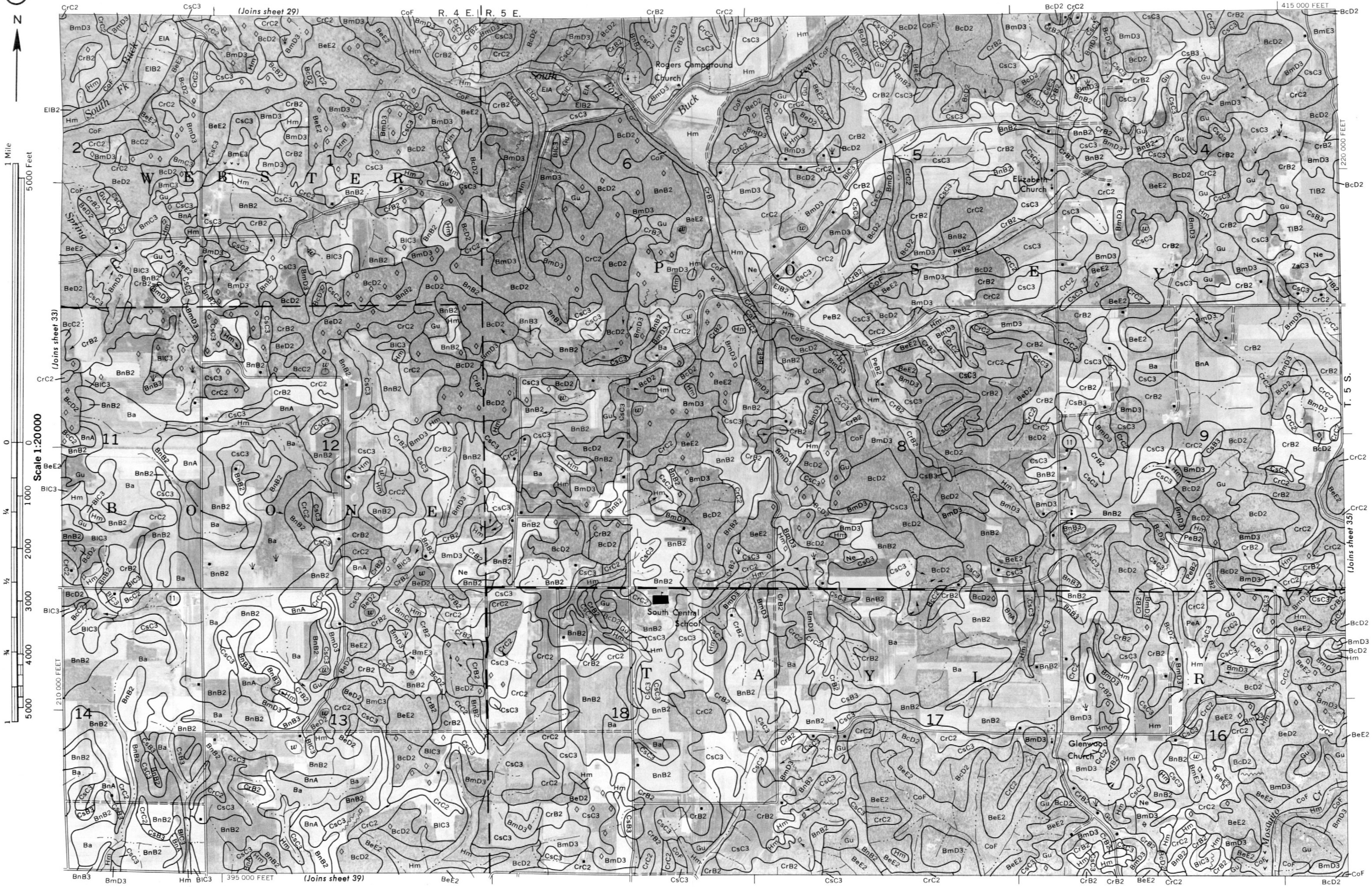
HARRISON COUNTY, INDIANA NO. 33

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 34



Land division corners are approximately positioned on this map.

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HARRISON COUNTY, INDIANA NO. 35

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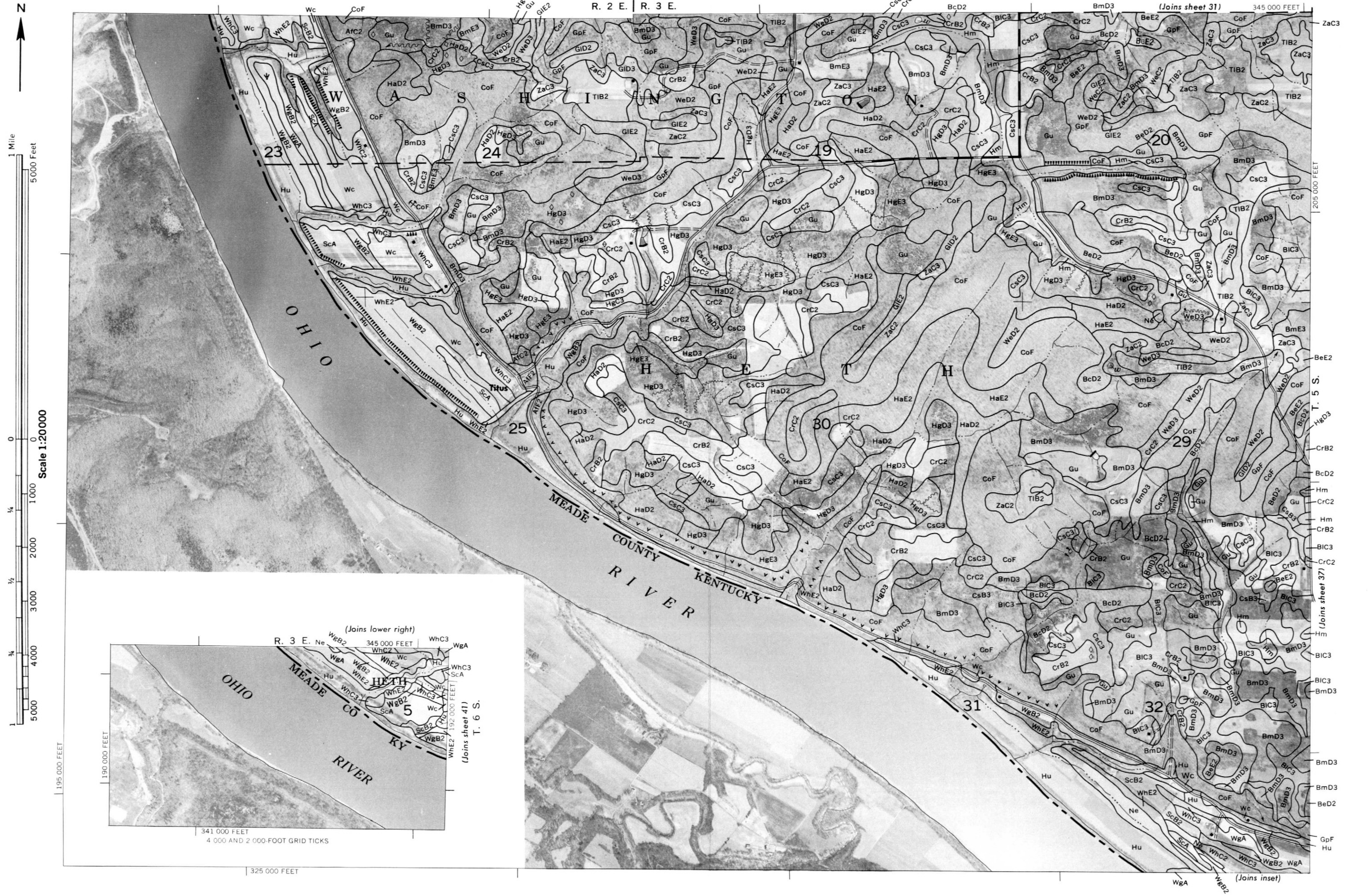
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.



Land division corners are approximately positioned on this map.

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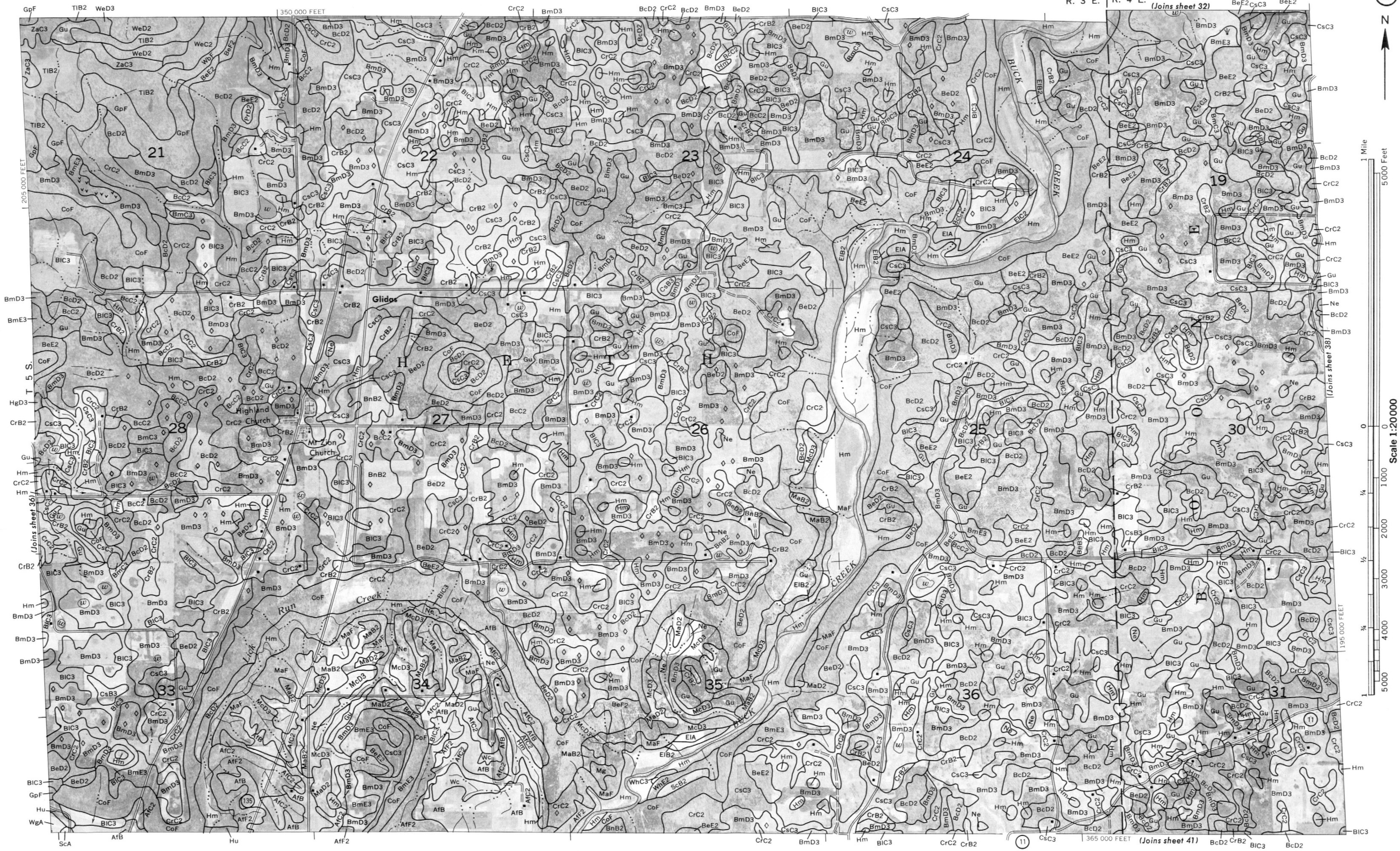
R. 3 E.
R. 4 E.
(Joins sheet 32)
(Joins sheet 36)
(Joins sheet 38)
(Joins sheet 41)
350 000 FEET
365 000 FEET
205 000 FEET
195 000 FEET
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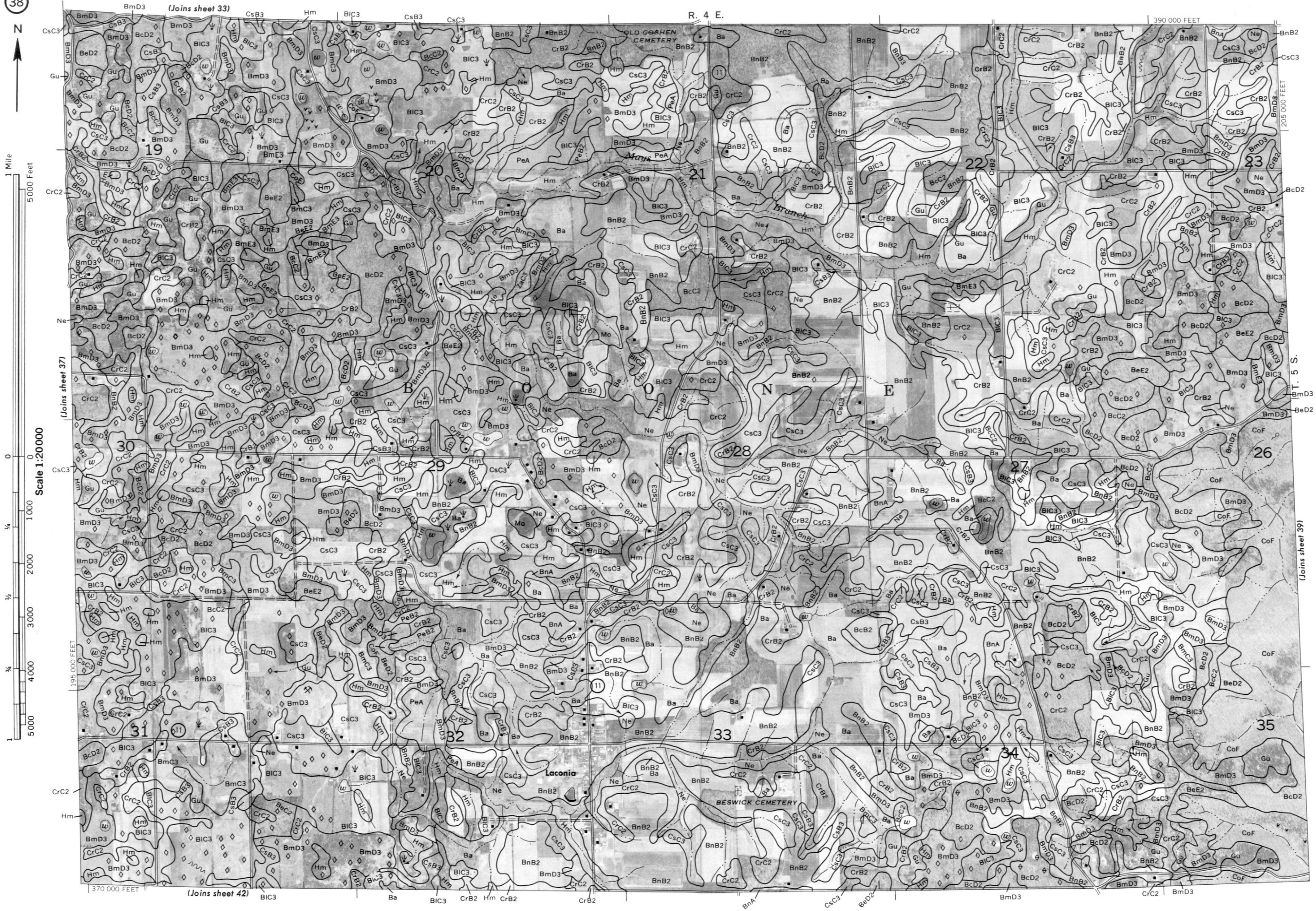
Glidas
Highland Church
Mt Zion Church
BUCK CREEK
Lick Run Creek
Scale 1:20000
1 Mile
5000 Feet



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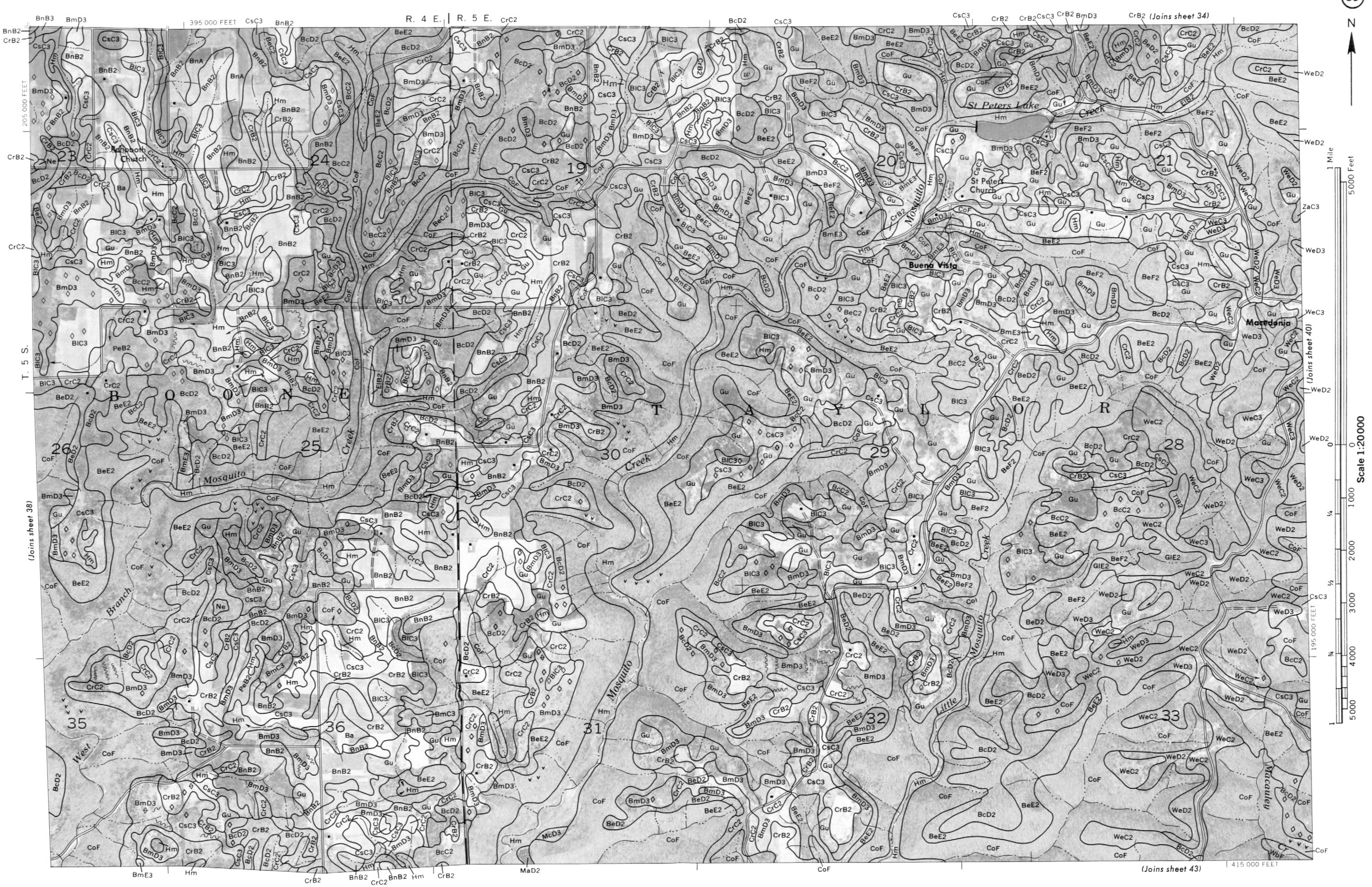

HARRISON COUNTY, INDIANA NO. 39

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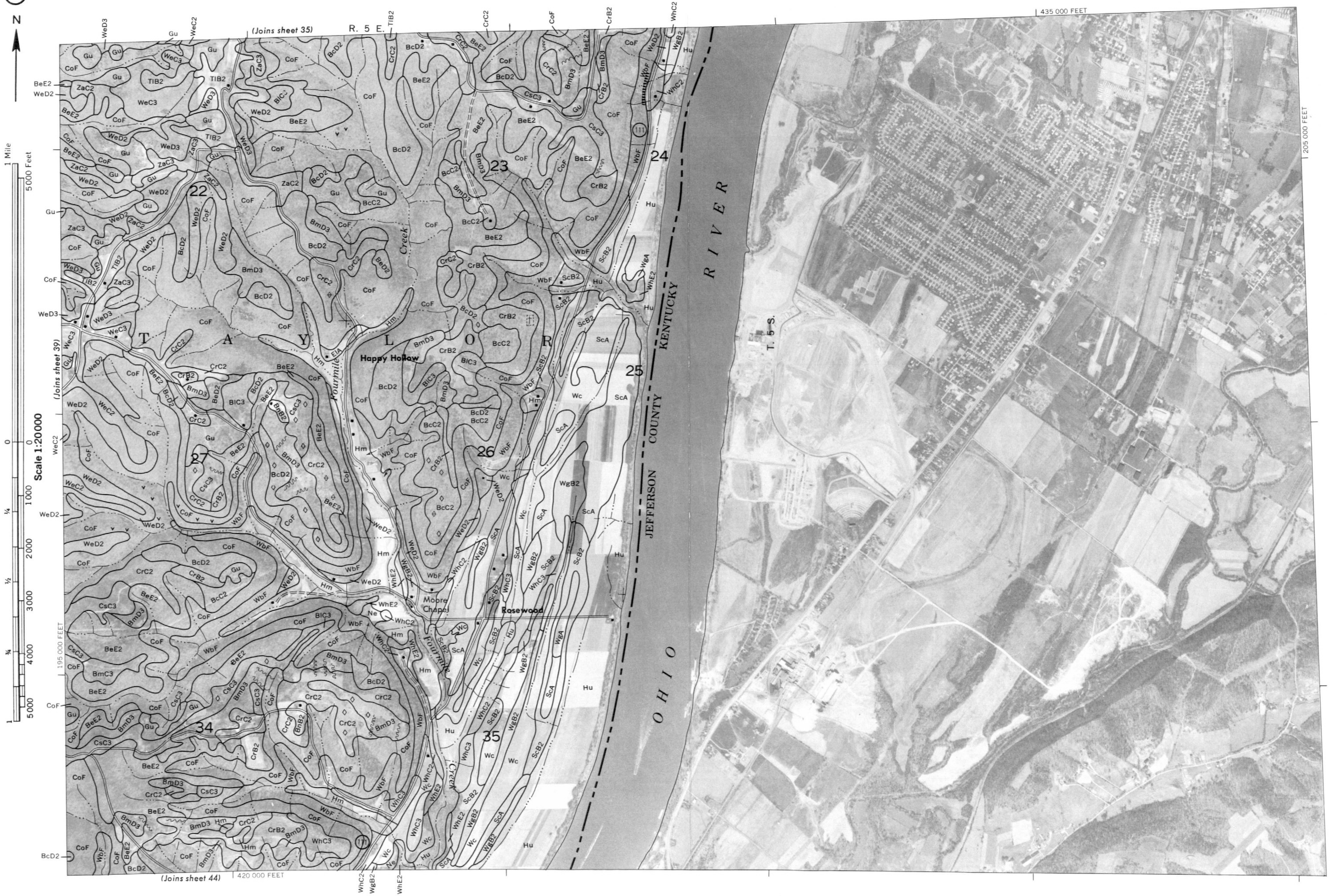
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 40



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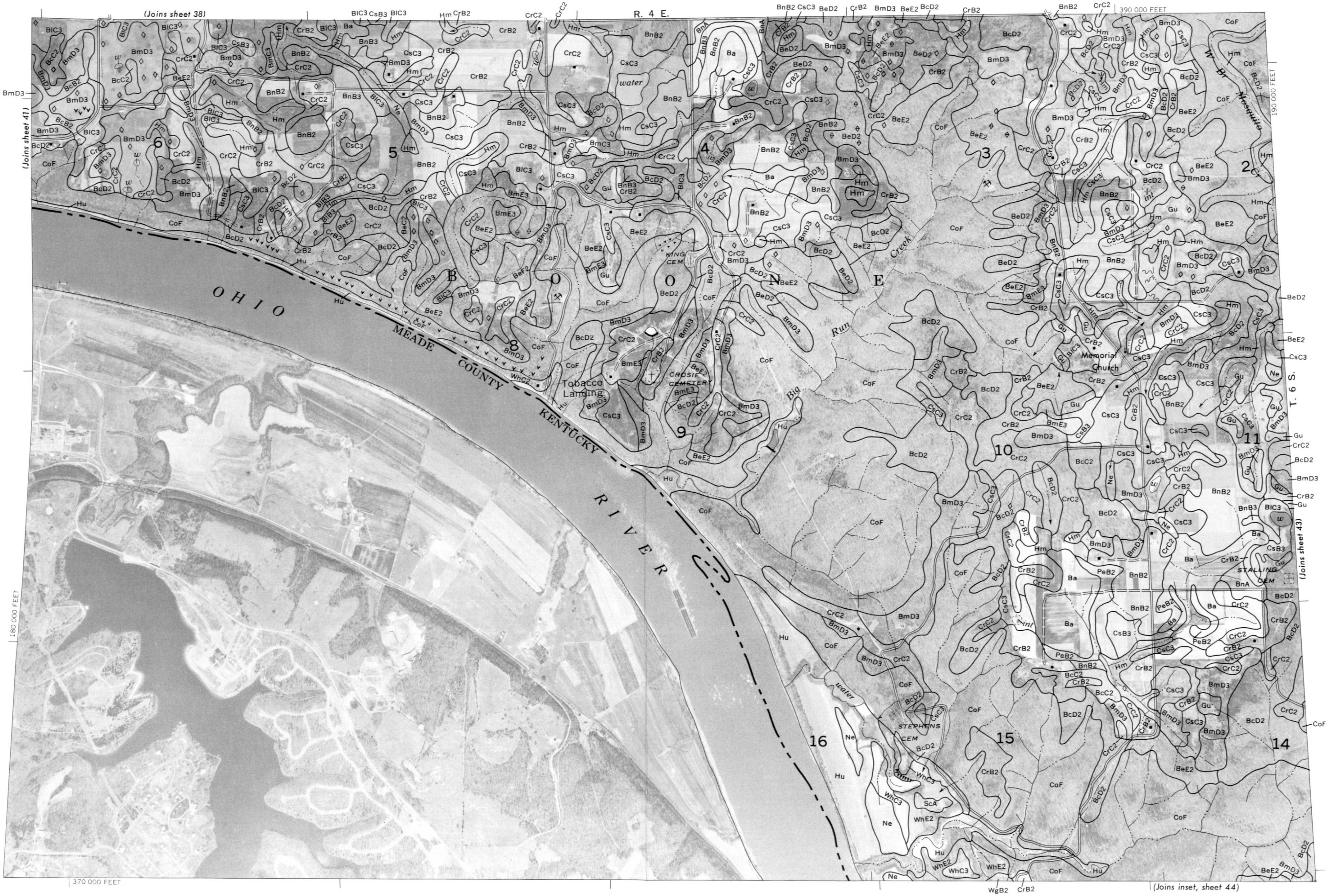
Land division corners are approximately positioned on this map.

HARRISON COUNTY, INDIANA — SHEET NUMBER 42



N

1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
Scale 1:20000

Land division corners are approximately positioned on this map.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Indiana coordinate system, east zone.

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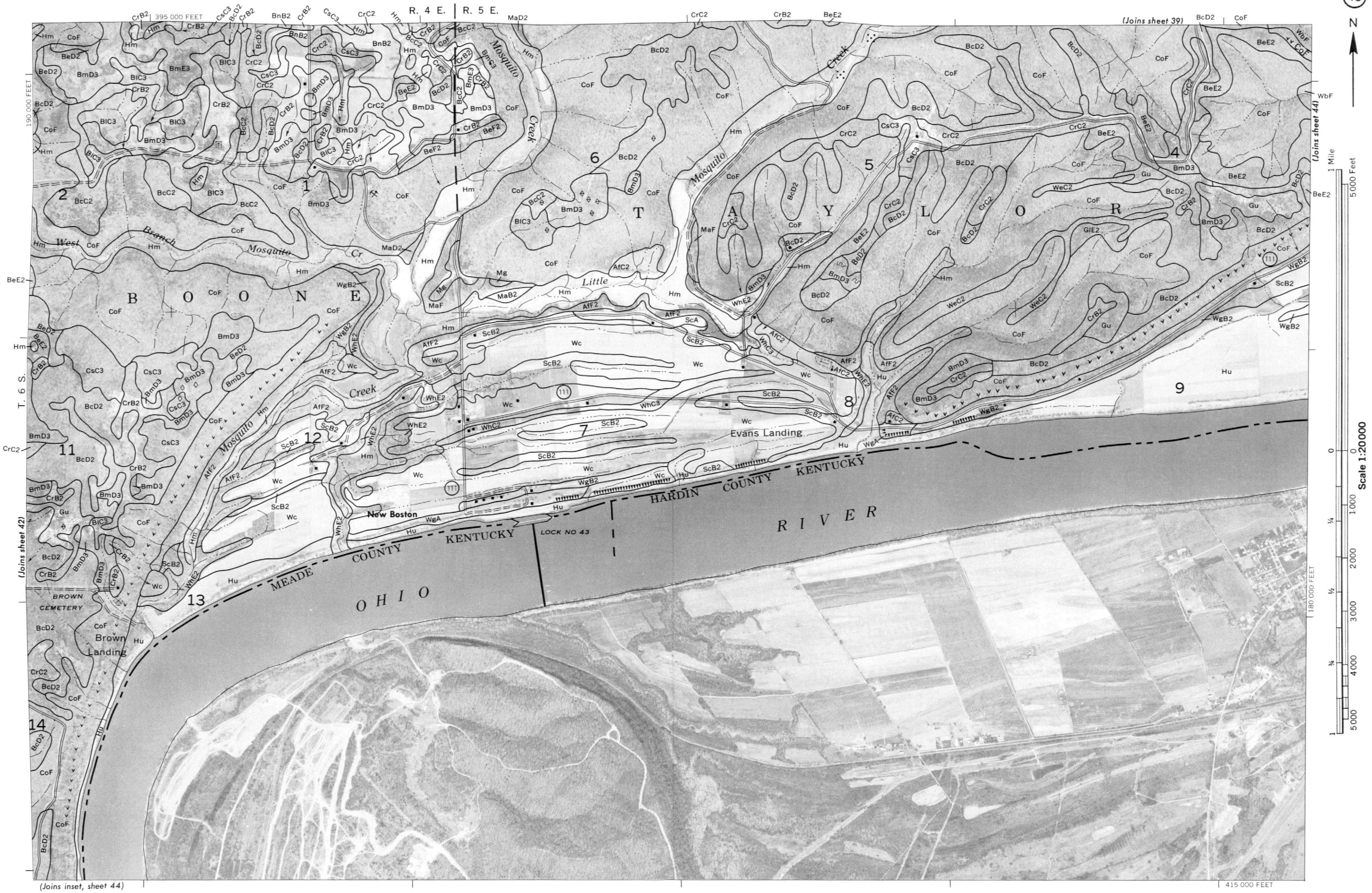

HARRISON COUNTY, INDIANA NO. 43
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Purdue University Agricultural Experiment Station.
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HARRISON COUNTY, INDIANA NO. 44